



THE 4RS IN ONTARIO
AN EXAMINATION OF SELECTED OPTIONS

Prepared for:
The Ministry of the Environment
and
The Ministry of Energy

By:
Victor & Burrell Research and Consulting
in Association with:
Smith, Auld & Associates Ltd.
MacLaren Engineers Inc.
Resource Integration Systems Ltd.

January, 1986

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On behalf of the Ministry of Energy and the Ministry of the Environment, a study for the "Development of a Strategy for Energy and Material Recovery to Implement the 4Rs for Municipal Solid Waste in Ontario" has been undertaken by the consultants, Victor & Burrell Consultants Limited, in association with Smith, Auld & Associates Limited, MacLaren Engineers Limited and Resource Integration Systems Limited.

The report entitled "The 4Rs in Ontario - An Examination of Selected Options" is the product of the terms of reference as completed by the consultants. The report presents selected options and the findings represent the views of the consultants.

This report prepared for the Ministry of Energy and the Ministry of the Environment is published as a public service for the development and evaluation of options to implement the 4Rs in Ontario. The Ministries do not, however, warrant the accuracy of its contents.

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Introduction

1. Background

Responding to concern about the growth in solid waste the Provincial government created a Task Force on Solid Waste during the early 1970's. The Task Force reported in 1974, recommending beverage container regulatory initiatives and the formation of a solid waste advisory body. The government developed soft drink container regulations, which were promulgated in 1976. The regulations were intended to encourage reusable soft drink containers.

The Waste Management Advisory Board was constituted and provided advice to the Ministry of the Environment on solid waste issues until the early 1980's.

The Program for Resource Recovery was announced in 1974. Its purpose was to decrease wastes going to landfill and encouraged municipalities to build and operate material and energy recovery facilities. It offered grants and loans. No grants were made under the program and it has since been discontinued.

The Experimental Plant for Resource Recovery was officially opened in 1978. It has provided a technical demonstration of various aspects of resource recovery. It has also served as a focal point for the Ministry of the Environment's attempt to develop markets for RDF, compost and other recovered materials.

The Ministry's source separation program was announced in 1981. It offers grants to multi-material programs, funding program losses for a start-up period of three years. The Ministry also promotes a design competition emphasizing the development of environmentally sound packaging.

The Ministries of Environment and Energy have jointly co-ordinated energy from waste and waste management projects since 1979. In 1982 the Ontario Ministry of Energy commissioned a report A Development Strategy for EFW from Municipal Solid Waste from Price Waterhouse Associates which recommended strong government support to assist the commercialization of an EFW industry in Ontario by the 1990s. In 1983, the Ministry of the Environment published its Blueprint for Waste Management in Ontario, which outlined approaches and suggestions for the future of waste management in the province.

Changes in underlying economic and energy conditions and a significant public response to the Blueprint led the Ministries to fund this study on the "Development of the Strategy for Energy and Material Recovery to Implement the 4Rs for Municipal Solid Waste in Ontario".

The primary purposes of this study were to evaluate the factors influencing implementation of the 4Rs, develop analytical tools to assist in the evaluation of strategic options, and outline a range of options open to the Ministries to encourage the 4Rs.*

2. Approach Taken/Tasks Completed

In undertaking or in carrying out the report we have:

- . Prepared a set of computerized analytical tools to assist the Ministries in drawing out implications of alternative courses of action related to the 4Rs;
- . Interviewed a number of actors directly and indirectly involved with landfill and alternatives to it -- municipal officials, representatives of the EFW and source separation industries, public interest groups, and so on;
- . Reviewed pertinent literature on the 4Rs in Canada and abroad;
- . Attended a number of public meetings in communities currently engaged in Environmental Assessment and the Master Planning Process;
- . Prepared assessments of current and possible 4Rs performance under a range of assumptions concerning key variables.

The results of our work have been:

- . The evaluation of factors affecting the implementation of the 4Rs in Ontario;
- . The identification of a range of measures available to the Ministries to increase the implementation of the 4Rs in Ontario;
- . The production of a set of computerized analytical tools which the Ministries may use in their efforts to assess policy options for energy and material recovery.

* The development of specific recommendations was not part of the terms of reference. The results of the study were to be communicated in an informal, point form report providing analyses of options for government policy consideration.

3. Report Outline

The report is submitted in two components: the main report and a set of appendices.

The main report presents the substance of the study's findings. Chapter 1 summarizes the main findings. Chapter 2 outlines major considerations for assessing 4Rs strategic options in Ontario and Chapter 3 examines forces favouring increased implementation of the 4Rs. Chapter 4 discusses the framework within which solid waste management and energy decisions are made in the province.

Chapters 5 and 6 discuss reduction and reuse; Chapters 7 and 8 discuss source separation and EFW separately. Chapter 9 examines centralized material recovery and composting. Because of the strategic importance of the municipality, Chapter 10 is devoted exclusively to this actor. Chapter 11 discusses background strategic considerations.

The background for much of the analytical work contained in the main report is to be found in the appendices. The reader is urged to refer to them for support and documentation.

4. Analytical Tools

A substantial portion of the project's effort lay in the development of computerized analytical tools for the Ministries. These include:

- . Evaluation framework. A microcomputer model which provides a framework for comparing the costs of alternative solid waste management systems. It is based on a benefit cost approach, with provisions for varying assumptions covering key variables: shadow price for labour, energy premium, etc.
- . EFW analysis. A model which analyzes the economic performance of EFW projects under a range of assumptions about strategically critical variables, for this project.
- . Source Separation 1. The Ministry of Environment data on multimaterial source separation projects was used to prepare a sample program for purposes of analysis.
- . Source Separation 2. A model to facilitate analysis of the impact on program performance of variations in key variables such as participation rates, waste quantities handled, distance to market, etc.

- . Tipping Fee/Diversion Credit. A spreadsheet model was used to calculate Tipping Fees and Diversion Credits under a wide range of assumptions about key variables.
- . Landfill Database. A large portion of the Ministry of Environment's landfill inventory was manually transferred to spreadsheets for use on a microcomputer.
- . Waste Quantities and Flows in Ontario. Population and household figures for each Ontario municipality have been combined in a model to evaluate the impact of different waste diversion options on waste flows in Ontario.

CHAPTER 1

Landfill and the 4Rs -- Principal Findings

The following summarizes some of the study's principal findings. It also sets out specific initiatives which the government might pursue. These do not constitute recommendations, but outline some main options. The reader is urged to refer to the main body of the text for additional information.

A. LANDFILL AND SOLID WASTE MANAGEMENT

I. Principal Findings

Landfill Constraints are a Major Factor Encouraging Source Separation and Material and Energy Recovery in Other Jurisdictions

Population pressure, inappropriate hydrogeological conditions, narrow jurisdictional responsibility for disposal and highly publicized past landfill failures have made new landfill sites scarce and difficult to acquire in many parts of the U.S. Much of the Northeast, California, Michigan and many other states have had great difficulty in obtaining new sites. These are precisely the areas where source separation programs and energy from waste have been most successful.

Landfill Approvals are Becoming Increasingly Difficult to Obtain in Many Ontario Municipalities

Two primary factors have worked together to make landfill more difficult to obtain in many Ontario municipalities:

- The Application of the Environmental Assessment Act

The public information and participation activities involved in Environmental Assessment have given anti-landfill sentiments a central focus and vehicle for expression. Opposition to landfill has been growing significantly over the past decade. Environmental Assessment permits this opposition to organize and express itself forcefully to municipal decision makers. This has significantly increased the controversy and political difficulty in siting landfill.

- The Increased Stringency of Environmental Approvals Requirements

Tightened hydrogeological standards and more rigorous requirements for site engineering, monitoring and leachate control have limited the sites now considered environmentally acceptable.

Landfill Related Solid Waste Management Costs are Increasing and are Likely to Continue to Increase in the Future

Site-by-site costs are showing the effects of more rigorous standards, increased difficulty in obtaining approval, and declining availability of economically attractive locations.

- . Capital and Operating Costs. Most recently acquired landfills show capital costs of \$.50 to \$4.50/tonne. Large, highly engineered sites are typically \$2.50 to \$4.50/tonne. Operating costs are in the \$4 to \$10 tonne/range for larger sites and can be significantly higher for small sites (\$15/tonne and up).
- . Perpetual Care. The Blueprint raised the importance of providing resources for ongoing post closure care of landfill sites to ensure environmental quality. While, at present, perpetual care is not an automatic requirement for new sites, it can be considered an element of landfill planning that will have increasing prominence in the future. A number of recently acquired and recently proposed sites have included these costs.
- . Compensation. Compensation payments to both individuals and receiving municipalities are likely to play an increasingly prominent role in the future.
- . Haul Costs. Population pressure, environmental stringency and the effectiveness of public opposition to landfill sitings have encouraged or necessitated the location of landfills further away from centres of greatest waste generation. Greater distances naturally entail higher haul costs.*

The higher the cost of landfill, the greater the economic value of alternatives to landfill, and the more are municipal officials likely to pay for these alternatives.

The Process of Acquiring Landfill Capacity Currently Provides the Major Opportunity to Obtain Municipal Support for 4Rs Implementation

Pressures and opportunities for 4Rs support coalesce during the landfill acquisition phase:

- . Political pressures against landfill are at a peak.
- . Information about 4Rs opportunities is intensively developed and widely disseminated as part of Environmental Assessment documentation and hearings preparation.

*These haul costs are sometimes included in the municipality's account for collection costs.

- . The landfill disposal savings attributable to 4Rs implementation can be maximized, since the future solid waste management system can be designed to optimize the contribution of each of its components.

Ministry Data on Existing Landfill Sites Suggests that the Planning and Approvals Process Will Need to Begin Over the Short and Medium Term for a Number of Municipalities

A number of municipalities are currently engaged in the Environmental Assessment process to acquire a site -- e.g., Waterloo, Halton, Peel and Ottawa-Carleton. Ministry data on existing landfill sites suggests that a significant number of municipalities will need to begin landfill acquisitions over the short and medium term. Given the lead time required to acquire sites (typically 5 years or more) and the municipal desire to have a margin of landfill security*, a number of additional municipalities would be involved in the process over the next 5 to 10 years.

II Possible Ontario Government Initiatives

The Ministry of the Environment should utilize the period leading up to and during the EA process as a primary focus for obtaining and maintaining municipal agreement to pursue the 4Rs.

This period provides the Ministry with the major opportunity to elicit agreement from the municipalities to pursue 4Rs initiatives. It is also the period during which the municipalities are willing to make the greatest financial contributions to the 4Rs. The government should take this period very seriously, ensuring that its efforts are coordinated and focussed on drawing out a maximum 4Rs commitment from the municipality. For instance, the Ministry of the Environment can use its position on study steering committees and its role as technical advisor on all aspects of solid waste management (including landfill) to encourage municipalities to examine the full range of 4Rs alternatives.

The government can use its full range of formal and informal program instruments to elicit these commitments. They should be made as binding and as long term as possible - through Certificate of Approval conditions, joint funding agreements and whatever other instruments are available.

From a tactical point of view the procession of municipalities through the EA process over the next 5 to 15 years may be the best indicator of the potential tempo and timing of 4Rs progress across the province.

*Metro Toronto, for example, has the objective of having at least 10 years landfill capacity at all times.

They should be high profile events treated seriously and monitored very closely at every level of the organization.

The Ministry of the Environment should clarify its overall priorities on the 4Rs to the Municipalities.

Currently there is a lack of clarity on the part of the municipalities concerning precisely where the Ministry stands on the 4Rs. The period leading up to the EA and Master Planning process provides the best opportunity to directly communicate Ministry intentions. To drive home the importance of the issue to the Ministry and the province, the communication to the municipality about EA and the priority attached to the 4Rs could be made directly by the Minister.

Information on trends in EA hearings and decisions should be widely distributed.

The Ministry can communicate the nature of recent EA studies, hearings and decisions across the province, so that even municipalities not currently involved, can be kept abreast of developments. Anticipation of having to go through the EA process eventually can provide effective stimulus to initiate 4Rs activity. It also heightens peer pressure. This has already been witnessed in some jurisdictions.

The Ministry can further strengthen the landfill requirements to provide additional incentive to the 4Rs.

More rigorous environmental enforcement, strict and conservatively based application of perpetual care requirements and the encouragement of full and fair compensation could all further reinforce the incentive to pursue 4Rs alternatives.

In addition, the levy of a landfill surcharge would have important symbolic as well as economic implications. It could provide ongoing funding for support to 4Rs research and implementation. It need not be levied across the province - those areas of the province where no 4Rs initiatives are practical could be excluded from the surcharge.

The Ministry can provide special ongoing technical and related informational assistance to smaller municipalities.

The Ministry can serve as a more effective information clearing house, maintaining and summarizing the main pieces of information coming out of the EA studies and related investigations. This role is particularly critical for smaller municipalities with limited resources.

B. REDUCTION

I. Principal Findings

Reduction through decreased purchases of materially intensive products, depends upon attitude change.

Attitudes are difficult to change dramatically in the short term. However, attitude change can have a fundamental impact on habits and behaviour in the longer term. The government can play a unique counter-role in providing a society-wide "antiwaste" message to compete with the pervasive commercial "prowaste" message.

Home composting is the major opportunity to increase reduction in the household sector.

About one third of MSW is compostable. The Kitchener recycling program's experience in attempting to stimulate home composting provides an important point of departure for future initiatives.

Commercial/institutional sector reduction can be encouraged by economic incentives and improved information.

A large portion of the commercial/industrial sector pays directly for waste disposal and has the incentive to reduce waste. However, experience with liquid waste generators in Ontario indicates that there are opportunities for economically decreasing wastes about which generators may not be aware.

Some local municipalities are interested in taking initiatives to encourage reduction.

The EA and Waste Management Master Planning processes have increased municipal interest about the possibilities for implementing information programs, as well as incentives and penalties for individuals and firms to encourage reduction. This municipal interest has also resulted in calls for provincial initiative in the area.

II Possible Ontario Government Initiatives.

Initiate a major cross-Ontario educational and informational campaign with a theme encouraging reduction reuse and recycling.

Attitude change is a long term process. The forces ranged against developing waste reducing attitudes and behaviour are immense - the full weight of the commercial messages in our society.

However, the time for such a campaign may never be more appropriate. Waste concerns are at a peak; the reusable packaging systems need public reinforcement and the developing provincial source separation program offers both a participation opportunity beyond "reduce and reuse" and a concrete vehicle for encouraging home composting.

Such a campaign could have a number of components: broad media advertising, an educational component directed specifically at schools and a portion aimed at the municipal level to be undertaken alone or in combination with the source separation program.

Assist municipalities wishing to initiate locally based information programs and incentives.

The provincial government can provide background information on the effectiveness of initiatives encouraging reduction - e.g., decreases in waste collection services - undertaken elsewhere. It can also identify and help resolve any unwarranted jurisdictional or legal roadblocks to their implementation. The provincial government can support the development of information initiatives in both the household and commercial/industrial sectors.

Explore launching a major home composting initiative.

Because of its theoretical reduction potential, and because of municipal interest, the provincial government should consider a province-wide program encouraging home composting.

C. REUSE

I Principal Findings

Reusables beverage containers market share has declined significantly in Ontario.

Reusable milk container share shrank from over 40% in the mid 1970's to 0% in less than a decade. Packaged soft drink sales in refillables have declined markedly and are coming under further pressure from new non-refillable containers. Though much less dramatic, beer packaging is beginning to follow the same trend, with the increase in can market share and the introduction of non-standard glass containers.

The proposed new soft drink container regulations are rumoured to provide an important opportunity to help extend recycling.

Without concerted enforcement and support, however the new regulations may not prevent the further erosion of non-refillable's market share.

II Possible Ontario Government Intervention

Prioritize the prevention of the further erosion of reusable beer container sales and encourage the maintenance and enhancement of refillable soft drink containers.

In the short term, the challenge is to prevent the further erosion of the refillable market. Public information and education, moral suasion and direct intervention could all be used.

Investigate and pursue making containers reusable or recyclable over the medium to long term.

In the medium to long term the challenge is to regain and extend the reusable containers' market share. One objective in keeping with this is to ensure containers are either reusable or recyclable. Local and internationally coordinated initiatives could move in this direction.

D. SOURCE SEPARATION

I Principal Findings

Source separation programs have demonstrated technical capability in Ontario.

Programs such as that in Kitchener have shown that it is possible for source separation to make an appreciable impact on the solid waste stream.

There is significant momentum for source separation across the Province.

The factors contributing to this momentum include: the Ontario government's information and grant programs with their nurturing of young programs and the development of experienced program operators; the highly visible demonstration of successful programs and attendant peer pressure on municipal officials; public pressure resulting from landfill acquisition needs and the Environmental Assessment process; improvement in key markets for recovered materials; the active marketing of source separation expertise by waste management companies; and the popularity of source separation with the public.

Source Separation programs require outside money to be economically viable.

While situations vary radically, under current market conditions mature programs appear to require about \$15 per tonne of material collected above what they receive from material sales. Programs can receive money through a combination of municipal diversion credits and provincial government funding, if they qualify. The municipal willingness to pay diversion credits has increased substantially. Continued government support beyond avoided solid waste management costs may be needed over the long term.

Significant program expansion may result from the new soft drink beverage container regulations.

This could be a major boon or a fundamental problem for source separation programs in Ontario.

Indications are that the new soft drink container regulations will provide a major incentive to increase the recycling network across the province. It appears that a combination of penalties for containers not achieving recycling targets and provincial and industry economic incentives will provide the initiative to program expansion.

If the widespread expansion discussed were to take place, it could represent a huge gain for source separation in Ontario and provide the basis for an expanding set of 4Rs initiatives. However, if not properly prepared and supported it could seriously jeopardize the gains that have already been made.

Program expansion could collapse* if adequate markets are not developed.

Secondary materials markets have a history of price fluctuation. Recently, markets have been fairly strong. A significant expansion of the source separation program across the province could result in a major market dislocation.

Apart from the normal economic sources of fluctuation, the nature of the newly expanded system may unconsciously add to price problems, especially for news. News provides the major revenue source to multi-material programs. It is dominated by a very few users. If the source separation system were to be propped up, virtually "whatever the cost" -- because packaging companies, participating municipalities and/or the provincial government may not be able to permit it to fail --

*Or require significant government financial support.

then the opportunity for news purchasers* to keep the price very low may be too easy and obvious to resist.

Curbside source separation programs for households provide a major opportunity to initiate and integrate other 4Rs components.

Source separation programs provide the opportunity for a number of potentially critical "add ons": reuse and reduction educational messages, home composting programs, the penetration of untapped commercial and industrial recyclable waste, the addition of other source separated materials such as waste oil and the integration of a household hazardous waste program. All of these can push further in the direction of achieving 4Rs objectives.

II Possible Ontario Government Initiatives

Aggressively pursue market development.

A number of forces seem to be working to increase recovered material supply. Market constraints now appear at the top of the list. The major priority is increasing the magnitude, but especially the diversity, of the news market in Ontario. Other markets which require attention are plastics and waste oil.

Moral suasion, tax breaks and subsidies, market stabilization initiatives and purchasing policies are a few of the opportunities that could be explored to expand the demand for these Ontario-recovered materials.

Provide economic assistance to programs; ensure government incentives encourage desirable source separation program development.

The provincial government's current assistance program funds program losses for qualifying programs for up to 3 years. Funding during the programs' first years can help overcome lack of experience and build program participation. At the time of writing it appears that the Ontario government will provide enhanced assistance to source separation with a program designed to complement the changed soft drink container regulations.

* Unlike the purchasers of glass, aluminum (prospectively), etc. who have packaging recycling targets to meet under the new regulations, the paper purchasers have no stake in ensuring recycling targets are met with Ontario reclaimed materials. U.S. news supply appears to offer a suitably reliable substitute, in any case.

In order for these source separation programs to develop into efficient delivery vehicles which can fully tap the economically recyclable waste in their areas, appropriate incentive vehicles are necessary. For example the development of efficient collection approaches should be actively encouraged and the extension of the programs to tap non-residential but recyclable wastes should not be penalized.

Encourage innovative program development; facilitate dissemination of program information.

Improved collection or upgrading technology, innovative techniques for increasing participation, and so on can help increase the economic attractiveness and viability of these programs. Government can help by providing economic and technical support. Similarly, the more broadly and effectively key information about successful program experiences is disseminated, the more resilient will the Ontario source separation network be.

Take full advantage of source separation programs to extend other 4Rs activities and vice-versa.

The Ontario government should use every opportunity to utilize the visibility and participatory nature of these programs to enhance its reduction and reuse initiatives. The reduction and reuse educational campaigns can, in turn, be used to help increase participation in the source separation program, extend the recyclables included in the program, and so on.

Support extension of the system to other materials as appropriate.

The Ontario government could use the system to push the recovery of additional materials, such as plastics, as the system and technology supporting it warrant. The government could actively encourage this through R&D support, with a view to constantly improving on recovery performance.

Provide encouragement and incentives to municipalities to support source separation programs.

Municipal support is central to program success. Full and continuing municipal funding should be encouraged. This can be done in a number of ways - through conditions applied to Certificates of Approval for landfills, by inducing municipal commitments through program funding formulae, and so on.

E. ENERGY FROM WASTE

I Principal Findings

EFW is perceived to provide a viable technology for the incineration of municipal solid waste in Ontario.

Mass burning energy from waste technology is perceived by many municipal officials to provide a reliable solid waste management technique. Information about the technology has been fairly widely disseminated. A network of project proponents and managers, equipment suppliers, design engineers and financiers exists in Ontario to provide the services and support needed to help projects come about.

The technique is of special interest to municipal decision makers because it provides what they perceive to be the greatest promise for large volume waste reductions.

Private sector steam producing plants burning MSW appear to require \$25 per tonne, and much more in most cases, to be economically viable in the absence of government grants.

Municipal avoided costs for landfill will normally be much lower than this figure. Consequently municipalities must be willing to pay a premium or government financial assistance will be required. A special economic fit, or a public sector proponent could reduce the required amount.

Private sector dedicated waste plants can demonstrate better economic performance.

Waste with a high BTU content, significant avoided waste management costs, and less stringent approvals requirements* can mean that these plants are more attractive economically.

The Siting of EFW plants is controversial in Ontario.

EFW plant siting has generated public response in London, the region of Halton, Toronto and elsewhere. Some of the concern relates to the industrial nature of the EFW facility. Other concern is connected directly to dioxin emissions. Some public interest group representatives have stated that no further plants should be approved pending clarification of dioxin performance.

*Private sector plants burning internally generated wastes are not required to go through the EA process.

Major concerns centre around the unpredictability of plant emissions, the lack of understanding of variables determining emissions from the incineration process and the suitability of the government's provisional guideline for dioxin.

Public opposition has constrained plant implementation in some areas. In Halton, for example, a prospective proponent withdrew in the face of public opposition.

The process of siting and gaining approvals for an EFW plant is complex, but can be accomplished.

The Victoria Hospital Project in London which passed through the EA process in the face of local opposition showed that EFW project implementation is possible in Ontario. The air emissions performance of the plant which passed Ministry of the Environment standards, including the provisional dioxin guideline, was approved by the Joint Board under the Consolidated Hearings Act. This project demonstrated the successful ingredients are a proponent, municipality and energy user willing and able to see the project through the approvals process. Adequate economic or other incentives are clearly needed to elicit this kind of commitment, however.

EFW appears to be compatible with other 4Rs measures at current levels of source separation, reduction and reuse performance.

The issue of compatibility of EFW with the other Rs is frequently raised. With source separation programs at current levels of performance, the impact on BTU level, especially from multi-material programs, is not likely to be significant. The major concern is to ensure that planning to incorporate both systems is done from the outset so that the EFW component is not oversized.

In the future, however, if major increases in reduction and recycling of the combustible component take place, EFW plant economics could be affected.

II Possible Ontario Government Initiatives

Address Air Emissions Concerns.

This could take the following form:

- . Clarify the Ministry of the Environment's approach to setting environmental quality standards.
- . Support EFW plant air performance monitoring as for Victoria Hospital.

- . Hold a full public consultation process on establishing Ontario's proposed dioxin standard.
- . Fund research on MSW incineration to clarify the relationship between refuse composition, operating conditions and plant emissions.

Provide funding support for EFW Plants

The federal FIRE program which provided up to a 20% grant on EFW plants has been cancelled. Class 34, an accelerated capital cost allowance is available for EFW plants. The province has considered providing funds to plants on a case by case basis. Victoria Hospital, for example, received provincial financial support. The primary motivation for this funding was the contribution of EFW to Ontario's energy security goals.

The province could fund EFW plants in a number of different ways - a percentage capital grant, shared savings with the participating municipality or a formula based on permissible rate of return to the proponent.

Because economic performance varies significantly from project to project, it is difficult to predict what levels of grant will be necessary to induce EFW participation. Thus if program take-up is a primary concern the granting formula could be geared to individual project characteristics, such as rate of return.

Provide continuing informational, technical and related support

The Ministry of Energy has provided up to 50% of the cost of feasibility studies for qualifying projects. EFW continues to be complex and expensive to evaluate and implement. The province could continue to make its expertise on EFW project implementation available, along with funds for the technical studies required.

Provide active market and project proponent support

Economically attractive EFW projects require a sizeable energy user with good load characteristics, the willingness to pay a reasonable price for energy and the desire to see the project through. These users are not easy to find. The Ontario government could offer some of its own facilities, Ontario Hydro, etc. as markets for EFW.

Similarly it could lower some of the cost of these projects by taking on risk directly by acting as project proponent, either directly or perhaps through a crown corporation.

Decrease approvals requirements

EA requirements are one of the complicating factors in putting together an EFW project utilizing municipal solid waste in Ontario. Projects such as the Ford EFW project in Oakville, which had only EPA requirements had a much easier time of it. Removal of the EA requirement, some suggest, would make it far easier to find municipalities and energy users willing to participate.

It should be pointed out, however, that removal of EA for EFW would be hard to justify in the absence of a blanket removal for other municipal projects, including landfill. This blanket removal is not only highly unlikely, but would be severely counterproductive for encouraging the 4Rs in general.

F. RESOURCE RECOVERY AND COMPOSTING

I Principal Findings

Resource Recovery and Composting are not perceived to be technologically mature by municipal decision makers.

Plant shutdowns and equipment problems in the U.S. have made Ontario decision makers somewhat cautious and skeptical about the application of the technology in this province. Early problems at the ERRP in Downsview reinforced this impression.

The markets for recovered materials and compost are perceived to be weak and insufficiently reliable for purposes of serious planning.

Materials from the plants are perceived to have difficulty finding a reliable and reasonably priced market, in part because of contamination problems. The RDF market is critical for these plants. While there has been serious interest lately from potential customers such as St. Lawrence Cement, there is no established market.

Compost is perceived to have similar problems. Competition from other materials and the unpleasant appearance (marketability) of plastics contamination difficulties have created a "wait and see" attitude.

Because it may reduce siting problems the technology is potentially attractive to municipal decision makers.

There may be fewer serious concerns with resource recovery than with EFW. This could be the case if the RDF were incinerated off-site at an established and acceptable industrial site.

II Possible Ontario Government Initiatives

Discontinue the ERRP program.

If the Ministry believes that municipal decision makers are uninformed about the technical and market potential for these products, then it could embark on a more aggressive campaign to overcome misconceptions. However, a major revamping of ERRP may be required to demonstrate more recent technology. Given the existence of plants in the U.S. which provide working examples of more recent technology, discontinuation of ERRP may be more appropriate.

Provide a demonstration of the technology in an Ontario commercial application

Halton and Peel are potentially interested in an RDF scheme tying into St. Lawrence Cement. This could provide the needed Ontario demonstration of commercial viability which the Ministry of the Environment has been seeking.

STRATEGIC OPTIONS

There are a wide variety of measures which the Ontario government may use to encourage the implementation of the 4Rs. They run the gamut from moral suasion through regulatory approvals and financial incentives to legislative and jurisdictional change. The government can pick and choose from the measures listed above and those contained elsewhere in the report.

The Ontario government also has a wide selection of incentives from which it can choose. Some of the principles which the government could adopt to order its priorities and make its choices are contained in Chapter 11, the Annexes to this report and Appendix 6. However, these are essentially policy matters which lie outside the scope of the study's terms of reference. The focus for the report has been the identification of options to promote the 4Rs. The terms of reference for the study specifically excluded policy recommendations. The team was directed to provide options only, not specific recommendations.

As for overall strategic themes for government intervention in the 4Rs over the next period, there appears to be a couple of major issues. The first is what should and what should not be favoured as solid waste management techniques over landfill. The primary reason for encouraging the 4Rs is that they confer net environmental benefits. Yet there is debate over whether some of the 4Rs actually result in environmental improvement. Energy from waste and resource recovery with RDF are the most controversial.

Is the leachate saved from not landfilling worse than EFW plant emissions? Very little concrete evidence appears to exist on this environmental comparison.

A major issue is, therefore, whether or not EFW and resource recovery should be favoured over landfill. One strategy would favour just 3Rs. In this case the emphasis would be on building upon the source separation network and promoting reduction and reuse through a variety of means, with a strong push toward education and attitude change, toward reduction and reuse by both the provincial and municipal levels. An important priority could be that of working toward "reduce, reuse, recycle" in a hierarchical fashion over the longer term, always seeking to move the system further up on the hierarchy.

The other major option would include EFW and resource recovery as well. The nature of the incentives - for example the level of grant proposed - should depend upon the relative prioritization and the long term perspective for implementation. It too could take the hierarchical perspective.

There are a large number of combinations possible for implementing the different 4Rs. Annex 3, reproduced from the Interim Report, shows one set of possibilities for EFW and source separation in isolation from the other Rs. Whatever the specific measures chosen, however, the following general points should guide 4Rs implementation over the next period. The strategy should:

1. Recognize that there is a special opportunity presented now by current general public concern about waste and waste management issues.
2. Utilize the growing public sentiment mobilized by the EA process to provide maximum pressure on municipal authorities to make commitments to and provide ongoing financial and other support for 4Rs implementation.
3. Draw on the full range of tools and measures available to the Ontario government to encourage 4Rs implementation. These range from regulatory powers through financial incentives to informal technical and policy advice which the Ministries make to municipal officials.
4. Actively pursue the interconnections that exist among and between the Rs and landfill to maximize 4Rs implementation opportunities. For example, source separation programs can be used to encourage reduction; and conditions attached to grants and landfill approvals can be used to encourage or require municipal 4Rs implementation. This should be firmly fixed in the Ministries' consciousness so that Ministries' internal division of responsibilities does not result in

a "hermetically sealed" approach to 4Rs implementation and the loss of opportunities to build on natural synergies.

5. Base programmatic initiatives on clearly defined medium and longer term priorities for 4Rs implementation.

At present these priorities are not well defined or clearly articulated.

CHAPTER 2

The 4Rs and Solid Waste Management in Ontario

2.1 The 4Rs -- Definition

The Blueprint for Waste Management in Ontario (1983) refers to the 4Rs as reduction, reuse, recycling and recovery. Figure 2.1 situates the different material and energy flows of interest for municipal solid waste. For purposes of the report, the following definitions will be used; they are identified by corresponding number in Figure 2.1.

1. Reduction: Any activity which lessens the quantity of residuals* flowing from a primary generator. (Primary generators are households and the commercial/institutional and industrial sectors.) Activities which fall into this category include:
 - . purchases of durable products
 - . purchases of products with a lower packaging component
 - . internal reuse of materials -- e.g., home composting of yard waste
2. Reuse: Any activity which results in the reuse of a residual without significantly altering its physical state. Returning refillable beverage containers, making industrial pallets available for additional use and the sale of a used car, all involve reuse.
3. Recovery: Any activity which reclaims residual material or energy for productive use. As Figure 2.1 shows, this can take place at several points in the waste cycle.

3.1 Material Recovery

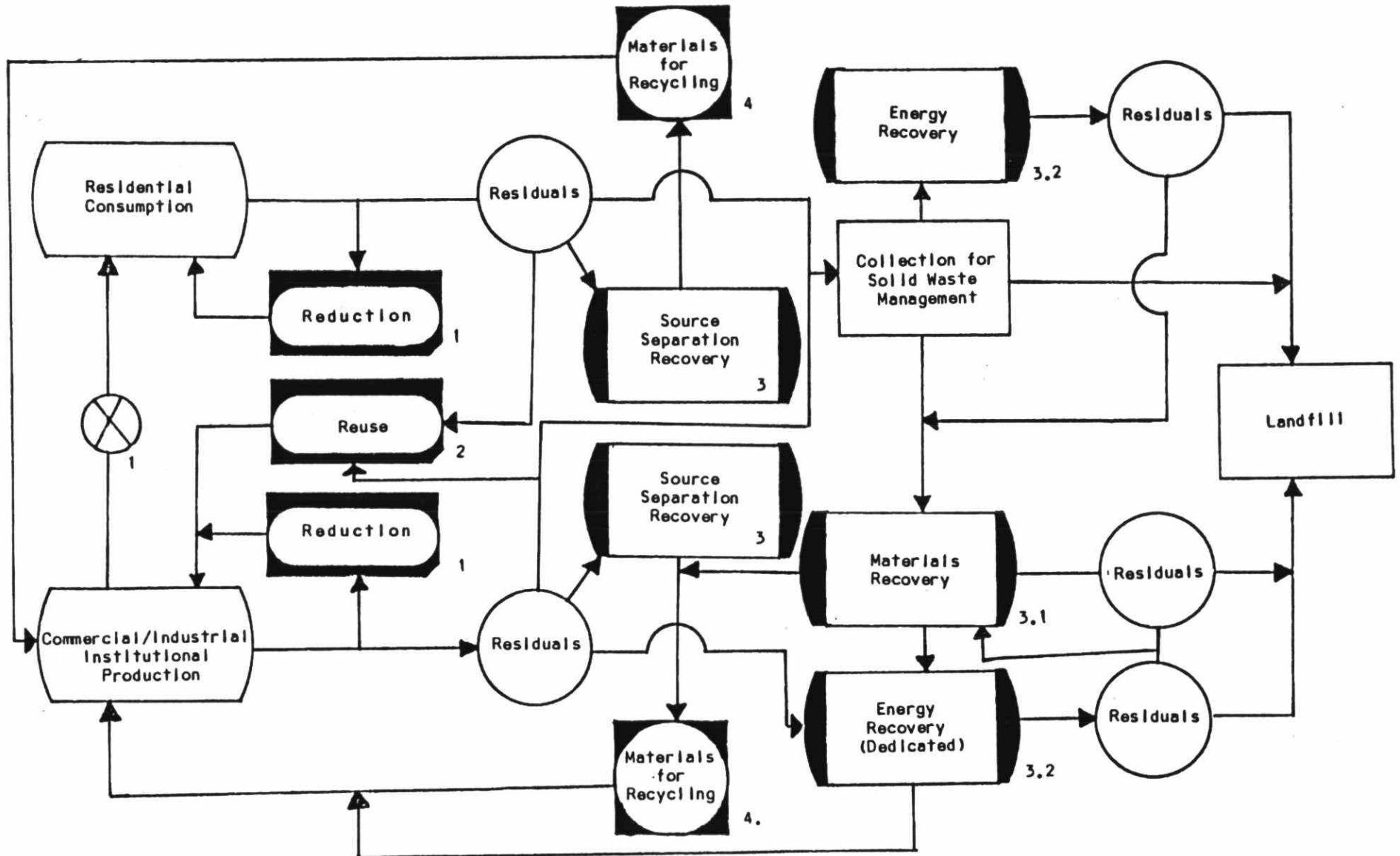
Precollection: Via complete or partial source separation residual materials can be collected at curbside, dropped off at depots, etc. before they become part of the solid wastestream.

Postcollection: Through mechanical or manual sorting, materials can be recovered for productive reutilization, such as through recycling.

*Residuals are materials which are considered to be no longer required and must be removed from their point of use. For purposes of this report, solid waste is considered to be any material handled by the solid waste system.

Figure 2.1

Residuals, the 4Rs and Solid Waste Management



3.2 Energy Recovery

Incineration of the combustible portion of residuals can take place at a number of places in the wastestream:

- Precollection: Industrial EFW plants can incinerate and reclaim energy onsite before residuals become part of the wastestream.
- Postcollection: Energy from waste plants can be designed specifically to incinerate all or part of the mixed municipal wastestream.

4. Recycling

The activity which makes use of material residuals by utilizing them as a productive input in a production process. Recycling can be thought of as incorporating two components: material recovery (3.1) and productive reuse (e.g., making steel with recovered food cans). Alternatively, it may be thought of as only the second part of the process: the utilization of the recovered input.

2.2 Actors and Decisions

The decisions which drive the system sketched in Figure 2.1, determining quantities of material involved in the system are made and influenced by five sets of actors: Generators of solid waste, solid waste managers, recovered material and energy users, government, the public.

The solid waste management system outlined in Figure 2.1 has the following decisions which are of central concern to this report:

- . The decision to reduce the quantities of residuals generated
- . The decision to make residuals available for reuse
- . The decision to make residuals available for recycling via a source separation program
- . The decision to establish and operate a source separation program
- . The decision to establish and operate an EFW centralized resource recovery or composting plant
- . The decision to establish and operate a landfill.

The actors involved in these decisions can be thought of as direct and contributive. Direct actors are those who have the authority and/or the responsibility to make the decision. For reduction and reuse decisions,

they are the generators of solid waste, both in the household and commercial/industrial sectors.

For source separation programs, the direct actors are the source separation operator and the municipal government; for EFW programs, they are the project proponent, the supplier of municipal waste, the energy user, and government approval agencies. The director actors in the landfill decision are the municipality and the provincial government regulating authority. Contributive actors provide economic or other incentives or disincentives, decide whether or not to participate in the programs, and influence the regulatory process.

Table 2.1 sets out the decisions and factors influencing them for the generators of solid waste. These relate to the reduction and reuse decisions and the decision to make waste available for recycling.

Figure 2.2 describes the actors involved in the source separation, EFW and materials recovery, and landfill decisions. The reader will note the central role played by the municipality in these latter decisions. The municipal authority is directly involved with source separation, EFW and materials recovery plant decisions involving municipal solid waste and is a contributive actor. The municipality can also directly and indirectly influence reduction and reuse behaviour.

2.3 The Wastestream and Pressure on Landfill

Over 6,300,000 tonnes of garbage are produced each year in Ontario. The continued emphasis on growth in material consumption, the spread of convenience food and convenience packaging, have added to the volumes of wastes to be handled over the past decade. While the growth in per capita waste generation appears to have slowed*, the pressure on Ontario's landfill resources continues. For example, Halton, Niagara, Peel, Waterloo, Ottawa-Carleton and others are currently engaged in major efforts to plan their waste management systems and locate landfills. Examination of the Ministry's landfill inventory reveals that many more municipal authorities will be entering into the site acquisition process over the next 5 - 15 years.

Using Ministry data on the environmental sensitivity of existing sites within certain receiving municipalities, Figure 2.3 shows that there are a number of municipalities with sites having fewer than 20

*The most recent detailed work available on waste generation trends was done by the Ontario Waste Management Advisory Board in the early 1980's. It concluded that "There is evidence that the upward trend in the per capita level of municipal solid waste generation has been broken". (Waste Management Advisory Board Annual Review, 1982, page 3.)

Table 2.1

Actor: Residual Generators - Household and
Commercial/Industrial Sectors

Role: Make the decisions which determine quantities and residuals generated
and the availability of these residuals for reuse, recovery and recycling

Sector	Decision	Factors Affecting Decisions
Household	Decrease the residuals generated by:	
	<ul style="list-style-type: none"> . Making purchasing decisions which lower total quantity of materials becoming residuals - decreasing the purchase of throwaways, etc. 	<ul style="list-style-type: none"> . Attitudes towards the benefits of reducing waste . Availability of products with lower material intensity . Information about availability . Convenience . Economic attractiveness of lower material intensity decisions
	<ul style="list-style-type: none"> . Making decisions to increase the internal reuse of materials -- by engaging in home composting, for example. 	<ul style="list-style-type: none"> . Availability of internal reuse options . Knowledge about the reuse options available . Convenience . Knowledge about and economic attractiveness of the reuse options
	Make residuals available for external reuse	<ul style="list-style-type: none"> . Availability of reuse options; eg., returnable containers . Attitude toward the benefits of reducing waste . Convenience . Knowledge about and economic attractiveness of external reuse options (eg., deposit level)
	Make residuals available for material recovery and recycling	<ul style="list-style-type: none"> . Availability of material recovery options -- curbside source separation programs, depots, buy-backs . Knowledge about recovery programs available . Attitudes toward the benefits of reducing waste . Convenience of the program . Economic factors such as costs of engaging in the program or a monetary inducement involved (eg., buy-backs)

Table 2.1 (continued)

Sector	Decision	Factors Affecting Decisions
Commercial/ Industrial	Decrease residuals generated by:	
	. Decreasing quantity of materials used which become solid wastes during the commercial/industrial activities.	<ul style="list-style-type: none"> . Amenability of the commercial/industrial activity to decreased material throughput . Cost of waste disposal . Perceived impact on profit of decreasing materials purchased . Knowledge of opportunities available for decreasing quantities purchased . Attitudes toward the benefits of recycling wastes
	. Increasing internal reuse and recycling of residuals	<ul style="list-style-type: none"> . Amenability of commercial/industrial activity to internal reuse . Knowledge of opportunities available for reuse and recycling . Perception of the potential impact on profit of internal reuse and recycling . Cost of waste disposal and net savings from reuse and recycling
	Make residuals available for external reuse (eg., reusable containers and industrial pallets)	<ul style="list-style-type: none"> . Availability of reuse options; eg., returnable containers . Attitude toward the benefits of reducing waste . Convenience . Knowledge about and economic attractiveness of external reuse options (eg. deposit level)
	Make residuals available for material recovery and recycling	<ul style="list-style-type: none"> . Availability of material recovery options -- curbside source separation programs, depots, buy-backs . Knowledge about recovery programs available . Attitudes toward the benefits of reducing waste . Convenience of the program . Economic factors such as costs of engaging in the program or a monetary inducement involved (eg., buy-backs)

Direct and Contributive Actors: Landfill, Source Separation, Material Recovery and EFW

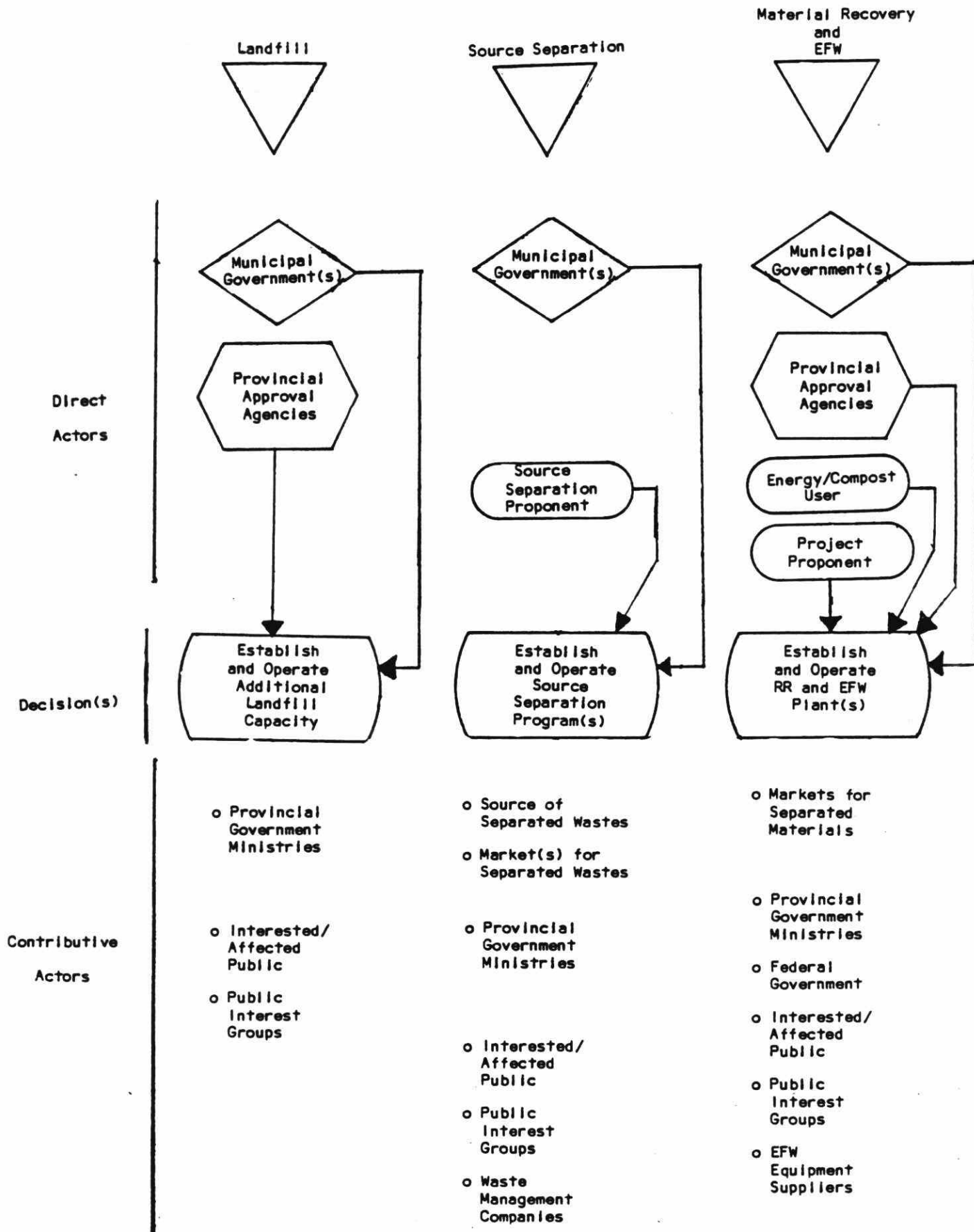
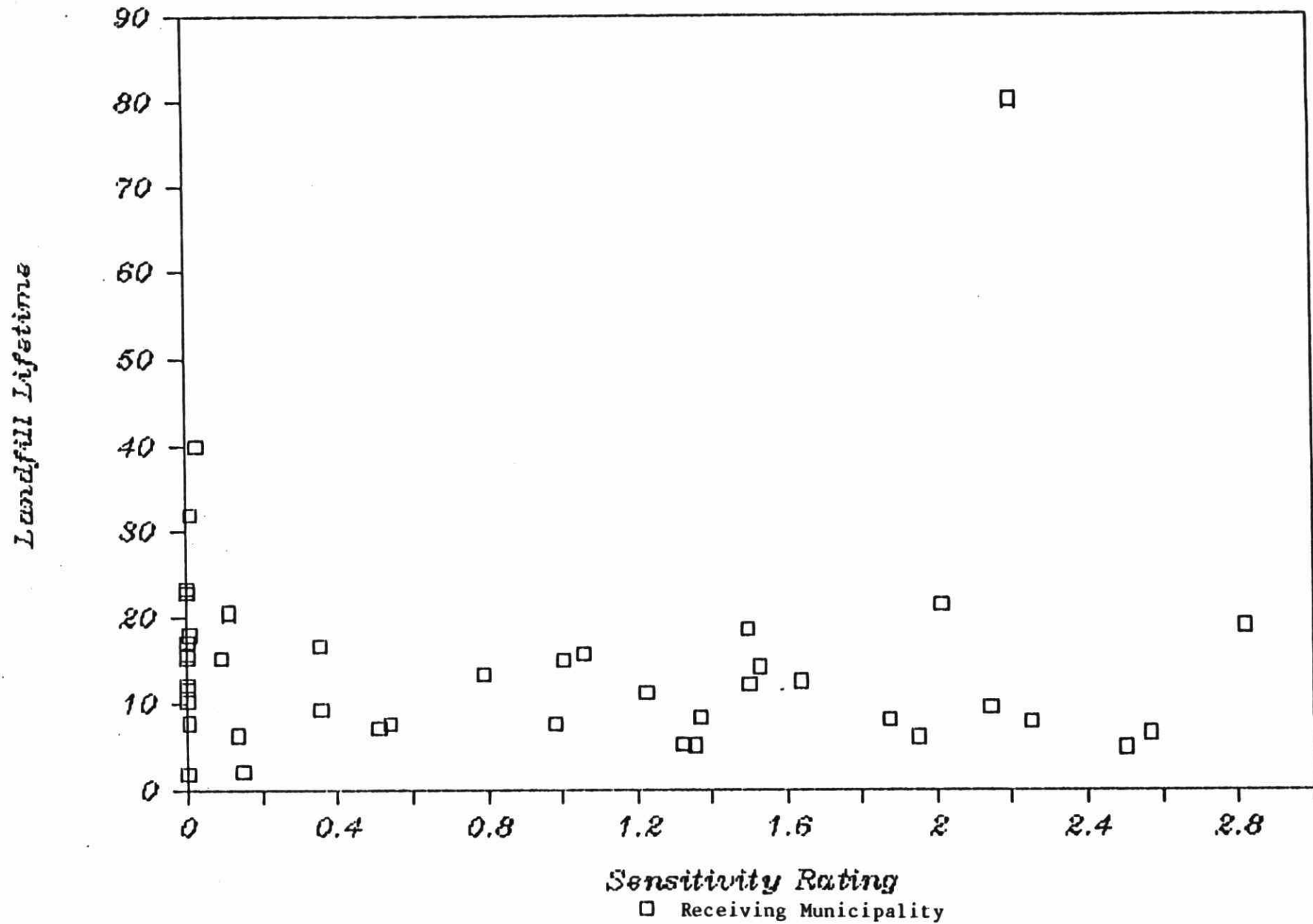


Figure 2.3

Landfill Lifetime and Sensitivity

Distribution by Municipality



years of life and a sensitivity rating that may indicate special difficulties in acquiring suitable new landfill locations.* Recent experience has shown that landfill approvals have been increasingly difficult to obtain.

Composition

Figure 2.4 shows the composition of waste estimated in the late 1970s. Since that time a number of trends have continued to shift the quantity of wastes:

- . Increase in plastics: Plastic packaging, continues to proliferate. A wide variety of different plastics which are very difficult for the consumer to differentiate have made their way into the wastestream. Mixed plastics are difficult to recycle. The increased percentage of plastics heightens concern about emissions from energy from waste facilities.
- . Laminates: The number of products and packages, which are impossible to recycle in their present form, continues to increase.

2.4 Changes in Public Attitudes and Awareness

Environmental concerns are high in the public's consciousness. Hazardous waste and spills, dump site leachate intrusion into groundwater supplies, the quality of drinking water in the Great Lakes, and air emissions are all high on the list of concerns.

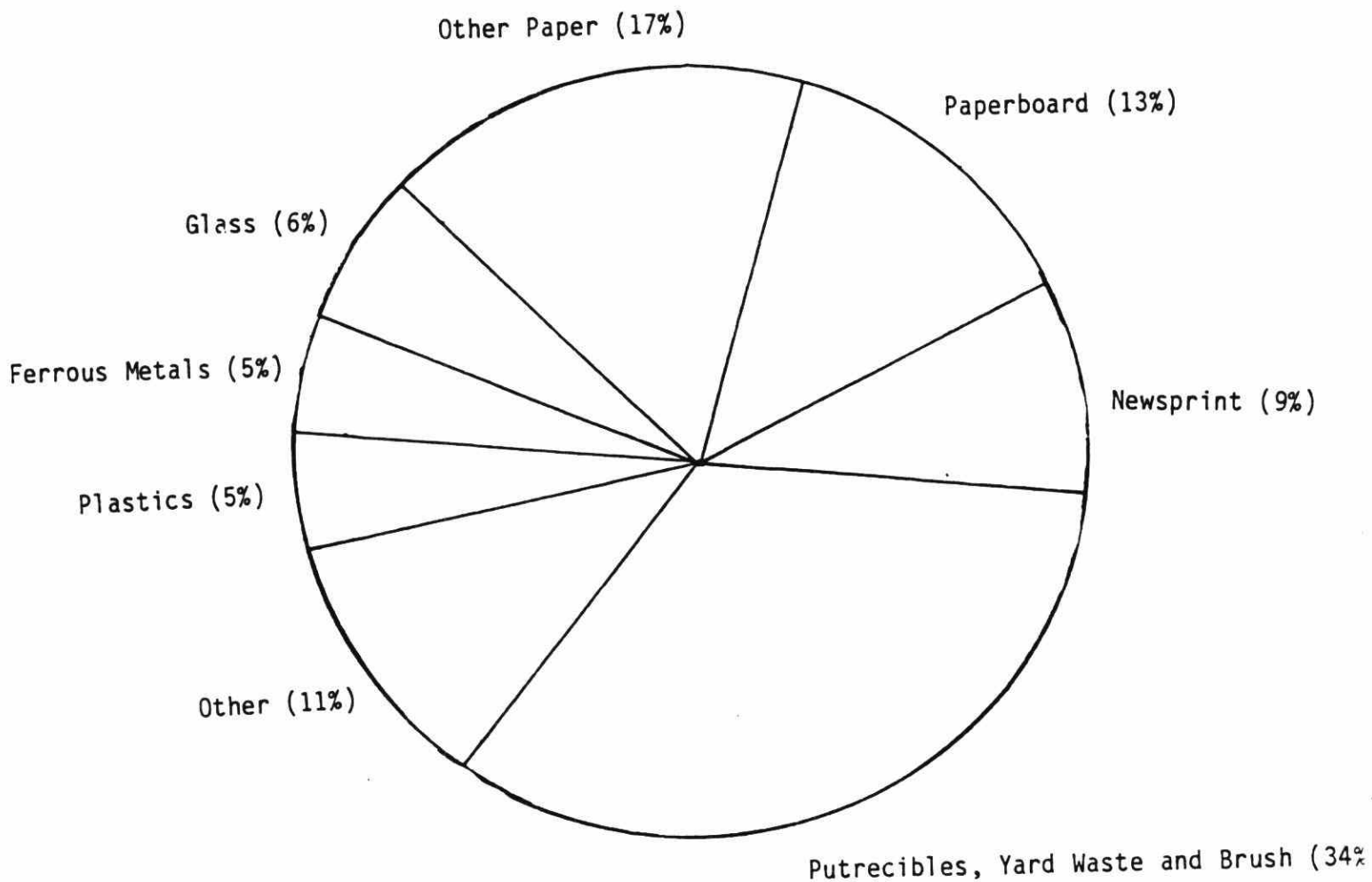
The public is sensitive to waste management issues. There was a significant response to the Blueprint. The Ontario Waste Management Corporation's public consultation process has elicited large-scale participation. Citizen's groups and individuals attended over 50 days of Environmental Assessment Hearings at Victoria Hospital's EFW application. Hearings for landfill sitings in Oxford County, the Master Planning process in Waterloo, the search for a landfill site in Peel and Halton's attempt to locate an EFW plant have all resulted in widespread public interest and input.

The people of Ontario are interested in waste management issues and expect to be consulted and involved in key decisions affecting the future of waste management in the province.

*The sensitivity ratings were derived using Ministry data on existing sites; they are used for indicative purposes only to show that hydrogeological concerns can be a constraining factor for a number of areas. Of course, zoning regulations, public opposition and other factors may be decisive in restricting site availability.

Figure 2.4

Average Waste Stream Composition



Source: Bird and Hale, Municipal Refuse Statistics for Canadian Communities over 100,000; October 1979

CHAPTER 3

The Driving Forces for Alternatives to Landfill

3.1 OTHER JURISDICTIONS

In Europe there are hundreds of EFW installations. In the U.S.* and the Far East there are dozens more. High levels of recovery and recycling prevail in Japan and many European countries. Source separation programs have recently proliferated in a number of countries like Sweden and the United States.

EFW

EFW has predominated in European countries where landfill is scarce. Government policies in countries such as France have favoured EFW by capital grants of 20% to the local municipalities implementing them. Typically, these have been plants which supply energy to district heating systems which are owned and operated by the municipality.

In the U.S. there have been two major factors:

- . Landfill Constraints: Population pressure, inappropriate hydrogeological conditions, narrow jurisdictional responsibility for disposal and highly publicized past landfill failures have made new landfill sites scarce and difficult to acquire in many parts of the U.S. Much of the Northeast, California, Michigan and many other states have had great difficulty in obtaining new sites.
- . Energy Prices: High energy prices, especially for electricity (up to 10 cents per kwh in some locales) have contributed to the economic attractiveness of many EFW applications.

Energy tax credits, favourable municipal financing vehicles**, and generally less stringent air emission requirements have also helped efforts to implement these plants.

*See Appendix 4 for a representative list of the U.S. installations.

**Industry revenue bonds and industry development bonds have been extensively used to assist EFW projects. There are tax-exempt vehicles employed to finance a variety of municipal projects, not just EFW plants. The U.S. government has been phasing out some of these advantageous features over the past years; similar moves have been made to make the energy tax credit less attractive.

Source Separation

High prices for recovered materials and population concentration help explain higher recycling rates for some European countries. Mandatory source separation in Sweden has dramatically increased its performance. In the U.S., concern about landfill constraints, environmental consciousness, and a particular set of problems related to beverage containers* have helped the proliferation of source separation programs.

States such as New Jersey have placed a heavy emphasis on recycling. A surtax on landfill has helped finance the start-up of multi-material programs across the State.**

In summary, the driving forces behind source separation and energy from waste programs in other jurisdictions have been:

- . Landfill constraints
- . High energy and/or recovered materials prices
- . Increased environmental consciousness
- . Government assistance (varying degrees of support)

3.2 ONTARIO

EFW

Over the past six years, several feasibility studies for EFW projects have been completed in Ontario. A small industrial application at Ford in Oakville is completed and London's Victoria Hospital EFW project is about to begin construction. Other projects are at various stages of assessment and approval.

Interest in EFW projects in Ontario has been stimulated by:

- . Rising Energy Prices: Major price increases in the mid-1970s and in 1979 prompted interest that EFW in Ontario could be a profitable self-sustaining industry.

*Opposition to reusable beverage containers and beverage container deposits have shifted attention to using source separation programs for beverage container recycling to improve environmental performance. The aluminum cans' high recovery value has provided the initial spur to many of the programs and the economic underpinnings for others. See Appendix 5 for details.

**New Jersey has tied a requirement for comprehensive county solid waste management planning to its recycling incentive program.

- . Government Incentives: To promote fossil fuel substitution, the federal government initiated FIRE* and Class 34**. The Ontario government has provided funds for feasibility studies on a cost-sharing basis and capital support for projects like Victoria Hospital on a "case-by-case" basis.
- . Waste disposal requirements: A increasing number of municipalities are facing severe landfill constraints. Some such as Peel and Halton have looked seriously at energy from waste as a technology which can provide significant diversion potential.

Source Separation

Source separation programs drawing on household waste have had a somewhat checkered history in Ontario. Historically, single material programs focussing on newsprint tended to come and go with market demand.*** More recently, some programs have been established on what appears to be a more firm and viable basis; a number of multi-material programs have also emerged. The key factors have been:

- . Market demand: The markets for source separated materials have strengthened somewhat. The opening of Ontario Paper's deinking facility in Thorold has had an important strengthening and stabilizing influence on the key newsprint market.
- . Government incentives: The Ministry of the Environment has provided market information, technical details on how to establish source separation programs and grants to fund multi-material programs over their first three years.
- . Environmental consciousness: The concern about waste, and the desire to use materials and energy productively, has increased and with it so has the pressure on public officials

*The FIRE program offered capital grants up to 20% of the capital cost of biomass utilizing projects including EFW. The FIRE program stopped making additional funding commitments in May 1985. Projects with commitments to that date will be honoured.

**Class 34 is an accelerated depreciation allowance which permits a straight-line 25%, 50%, 25% write-off of qualifying energy-related equipment. While Class 34 has been extended "indefinitely", the federal government is currently reviewing the overall tax structure.

***Rising and falling with the product cycle of boxboard and building papers and the meteoric career of the cellulosic insulation manufacturing industry.

to facilitate programs. It has been displayed most vividly at the local level during the Environmental Assessment and Master Planning process for solid waste management planning and landfill approval.

- Landfill constraints: The process of acquiring new disposal capacity has given a high profile to the potential role which source separation can play. In Waterloo, Peel, Ottawa-Carleton and Halton, public sentiment has pushed strongly for more source separation. A number of municipal governments (Peel, Halton, Pelham, Hamilton-Wentworth, Metro Toronto) are offering diversion credits to source separation programs.

The future momentum for the 4Rs will be determined in large part by the decision framework for solid waste management in Ontario, the factors affecting 4Rs implementation, the role of the municipality and the strategic approach taken by the Ontario government. These are taken up in turn in the chapters which follow.

CHAPTER 4

The Decision Framework for Solid Waste Management

4.1 The Current System

The current system embodies a number of relatively recent changes to decision making in Ontario. Most of these have reflected the trend for increased environmental stringency and greater public participation in decision making.

4.1.1 Responsibilities

The responsibility for solid waste management lies at the municipal level. However, the assignment of this responsibility is not consistent. Fig 4.1 shows the division of disposal and collection responsibilities between counties, regional municipalities and local municipalities.

Typically, the upper tier authority has responsibility for disposal and the lower tier authority handles collection. Most of the population of Ontario lives in areas where the responsibility for waste management is shared between two municipal authorities.

Standards of construction and operation relating to solid waste management facilities reside with the province. Prior to the 1970s, the disposal techniques of choice were a combination of incineration and landfill. With the tightening of air quality performance requirements, incineration declined markedly. By the 1970s, landfill was preeminent.

4.1.2 Requirements -- Environmental Approvals and Standards

Landfill

All landfills require a Certificate of Approval (Environmental Protection Act) from the Ministry of the Environment to operate. Site acquisition, engineering and operations must all meet Ministry requirements.

Over the past decade, these requirements have tightened considerably. Much more rigorous site engineering and operation is now required. Hydrogeological standards have toughened and requirements for monitoring and leachate control have become more rigorous. Draft Regulation 309 embodies these more stringent standards which have been put into practice over the past decade.

Chart 4.1: Municipal Solid Waste Management Roles and Responsibilities

Municipality Name / Type	Waste Disposal Sites	Waste Collection	4 R's	Powers to prevent others from disposing	Powers to build outside boundaries	Garbage Truck Routing	O N B Role
Halton, Durham, York Regions	Mandatory obligation to establish	No	Yes, but not York	Yes	No	Can approve area munic. routing plan	Hears persons who have been turned down on a site by Region
Area municipal powers in Halton & Durham Regions	Only with the consent of the Region	Yes	No	No	No	Measure of control on local roads	Hears disputes between area munic. & Region on truck routes
Oxford Cty., Waterloo, Sudbury, Peel, Halton-Hurford, Hamilton-Wentworth Regions	Mandatory obligation to establish	No	No, except Waterloo	No	No	No	None
Area municipalities within the above	Precluded	Yes	No	No	No	No	None
Ottawa-Carleton Region	Mandatory obligation to establish	No	No	Yes	No	Can approve area munic. routing plan	No O N B appeal on site refusals by Region
Area Municipalities within Ottawa-Carleton	Only with the consent of the Region	Yes	No	No	No	Can control routes on local roads	Regional truck refusals of area munic. plan heard by O N B
Niagara Region Nuskoka District	May at the request & with agreement of area munic.	No	No	No	Yes	No	O N B hears if area munic. or District or Niagara attempts to build outside of upper tier boundary & area munic. objects
Area municipalities within the above	Yes	Yes	No	No	Yes	No	
Metropolitan Toronto	May establish sites	No	Yes	No	Yes	No	O N B holds hearings when Metro fails to receive consent of local host munic. for site establishment
Lower tier municipalities within Metro Toronto	May with the consent of Metro Toronto	Yes	No	No	No	No	
Counties	No	No	No	No	No	No	
Municipalities within Counties	Permissive May build sites	Yes	No	No	Yes	No	Hearings if host munic. outside of proposed munic. does not agree to site
Separated municipalities within Counties	May build sites	Yes	No	No	Yes	No	
Municipalities outside the Regional / County structure	May build sites	Yes	No	No	Yes	No	

Source Separation

Because source separation does not entail stationary source of air or water emissions, it does not fall under any special Ministry approval requirement.

EFW and Centralized Resource Recovery

Energy from waste plants and centralized resource recovery must meet Ministry standards for air and water emissions.

4.1.3 Requirements -- Approvals Process

Environmental Assessment Act

The Environmental Assessment Act applies to all significant municipal undertakings. If a proposed landfill is municipally operated, then Section 30 of the Environmental Protection Act automatically triggers an Environmental Assessment. Private landfills approvals do not require an Environmental Assessment.

The Environmental Assessment Act requires a consideration of the full range of alternatives to landfill. Its purpose is to encourage good planning. Public participation, while not mandatory, in practice is an integral part of the process.

Master Planning Process

In order to encourage long-range waste management planning and provide a focus for integrating some of the Environmental Assessment requirements, the Ministry of the Environment encourages the use of the Master Planning Process. The Ministry provides funding to municipalities willing to engage in the three stage process. Its purpose is to encourage a comprehensive plan with at least a 20 year time horizon, and to facilitate the development of regional solutions to solid waste management problems.

While regional municipalities such as Waterloo are well advanced in the process, no municipality has yet completed all its steps.

4.1.4 Perpetual Care and Compensation

- Perpetual Care. The Blueprint raised the importance of providing resources for ongoing post closure care of landfill sites to ensure environmental quality. While, at present, perpetual care is not an automatic requirement for new sites, it can be considered an element of landfill planning that will

have increasing prominence in the future. Costs of perpetual care vary from site to site depending upon the need for ongoing leachate treatment and the proximity of the site to low cost treatment. Costs can be prohibitive for sites with poor attenuation characteristics remote from access to economic treatment.

- . Compensation. Compensation payments are likely to play an increasingly prominent role in the future. Municipalities disposing of wastes in other jurisdictions have often paid compensation to the receiving municipality.* The difficulty of acquiring sites in outside jurisdictions will tend to push the compensation up for those municipalities able to make these arrangements.

Compensation to individuals or groups affected by the construction and operation of a landfill is also receiving a higher profile. It is being viewed by some as the approach needed to gain site approval. In addition, a precedent has been established by the Ontario Municipal Board that it will award "injurious compensation" -- namely, redress relating to the reduction in market value or business and personal expenses related to landfill construction. This could add another, perhaps significant, cost to landfill acquisitions.**

4.2 Implications of Current System

1. Landfill Capital and Operating Cost Impacts

The factors pushing to increase capital and operating costs of landfill include:

- . More stringent environmental requirements:
 - more highly engineered sites
 - higher operating costs, including monitoring and leachate control
- . Approvals process requirements (under EA or hearings under EPA):

*For example, in the past, London paid \$.10/tonne to Westminster Township. Toronto pays a total of approximately \$1/tonne to Vaughan and York.

**The OMB has interpreted landfill construction to include the period up to the completion of the landfill's active life -- not just the completion of the site work prior to operation.

- because the process is an open one with extensive opportunity for public input, and
- because a wider range of alternatives must be considered, it is reasonable to expect that approval costs will increase*

. Perpetual care and compensation costs

Not all of the trends are toward landfill capital and operating cost increases, however. The allocation of disposal responsibility to the upper tier, the philosophy behind the Master Planning Process and the difficulty of obtaining new locations have all encouraged the acquisition of larger sites. As Appendix 1 shows there are clear economies of scale. More recent acquisitions show capital costs running between \$.50 and \$4.50 per tonne and operating costs in the \$4-\$10 range for larger sites**.

2. The Impact of Being Forced to Consider Alternatives Under EA

For municipal proponents*** the EA process requires that all reasonable alternatives to landfill be considered. This:

- highlights the role which the 4Rs can play
- forces decision makers to justify not having the 4Rs play a central part in the waste management system.

While the EA process definitely requires the consideration of alternatives, the process does not specify how they should be evaluated and ranked. Municipalities have disposal responsibility, while the EA decisions are made by the Environmental Assessment Board, a provincial body. This can create methodological confusion and criteria conflict.

The siting of waste management facilities is controversial: it can involve delicate political trade-offs within and between municipalities. Criteria which are considered "objective" and

*It is clear that a number of changes can be made to the Environmental Assessment Process to focus it better and decrease the amount of time required to deal with key issues. It is an open question whether or not the approvals costs will increase significantly, given the option of using the Consolidated Hearings route.

**See Appendix 1 for details.

***The inconsistent application of the Environment Assessment process to public sites can skew a waste management decision, favouring private sector applicants for both landfill and EFW plants.

applicable on a province-wide basis may conflict with local perspectives and conceptions of appropriate trade-offs.

Consequently, there are two concerns about the process: first that it is too vague and open-ended in its requirements; and second, that provincial criteria can intrude and override local decision-making perspectives and criteria for solid waste management. Could the process be more prescriptive about the nature of the analysis to be undertaken without eliminating the flexibility needed to incorporate local perspectives? It may be possible to establish clear guidelines for subcomponents of the analysis -- e.g., economics -- without specifying the synthesis and weighting procedures to be used.

3. The Impact on Landfill Sitings

Increased environmental stringency and heightened public participation mean that landfill sitings will be harder to obtain, more protracted, or more politically painful. In general this will mean:

- greater distances from waste generation centres and therefore higher haul costs, and the possibility for higher diversion credits for landfill alternatives -- source separation and EFW plants located close to waste generation centres
- greater political insecurity about obtaining the "next" landfill and therefore a greater willingness to look at permanent waste diversion alternatives, even if this means paying a higher price.

4. Implications of Split Jurisdiction

Some aspects of solid waste management planning make it convenient and useful to have both collection and disposal responsibilities integrated at the same level.

Several municipal officials, with whom we discussed the issue, suggested that both collection and disposal responsibilities should be integrated at the upper tier. This would enable disposal planning to take place in a much more "predictable" environment and could decrease the complexity of implementing the 4Rs. Since quantities would be assured from area municipalities, it would also facilitate cross-regional initiatives such as source separation programs across municipal boundaries. However, integration could decrease the incentive for certain area municipalities to engage in the 4Rs. For example, area municipalities which pay the upper tier municipality for disposal on a tonnage basis have the direct incentive of avoiding the tipping fee. Integration of functions could eliminate this incentive.

CHAPTER 5

Reduction

The decision to reduce the amount of waste produced has the greatest beneficial impact, in that it removes the necessity for any of the activities associated with waste management. The actors directly involved with reduction decisions are households and commercial/industrial generators of residuals.

Other actors include product manufacturers who offer consumers the range of purchasing choices, the retailing sector, and governments who establish the regulatory and fiscal framework within which both consumers and producers of goods make their decisions.

There are two components to reduction:

- . Decreasing the quantities of materials purchased which become residuals. This can involve such activities as:
 - purchase of materials which have a lower material content
 - purchase of more durable commodities
 - purchase of materials which have a lower packaging content.
- . Increasing internal use of residuals for other purposes; for example:
 - composting of yard waste in the residential sector
 - use of one residual stream as an input into another -- for example, the internal recycling of mill broke by paper manufacturers.

Household Generators

Consumers in Ontario are constantly bombarded by commercial messages and products which explicitly and implicitly extoll the virtues of consumption. Mass merchandising and mass marketing emphasize products with high packaging content and fast turnover.

Table 2.1 in Chapter 2 summarized the key residual generating decisions in the household and commercial/industrial sectors. These decisions are primarily concerned with reduction, reuse and making materials available for recycling.

As the Table, reproduced on the next pages shows, the household's decision to decrease purchases of material-intensive products -- a decision

Table 2.1

Actor: Residual Generators - Household and
Commercial/Industrial Sectors.

Role: Make the decisions which determine quantities and residuals generated
and the availability of these residuals for reuse, recovery and recycling

Sector	Decision	Factors Affecting Decisions
Household	Decrease the residuals generated by:	
	<ul style="list-style-type: none"> . Making purchasing decisions which lower total quantity of materials becoming residuals - decreasing the purchase of throwaways, etc. . Making decisions to increase the internal reuse of materials -- by engaging in home composting, for example. 	<ul style="list-style-type: none"> . Attitudes towards the benefits of reducing waste . Availability of products with lower material intensity . Information about availability . Convenience . Economic attractiveness of lower material intensity decisions . Availability of internal reuse options . Knowledge about the reuse options available . Convenience . Knowledge about and economic attractiveness of the reuse options
	Make residuals available for external reuse	<ul style="list-style-type: none"> . Availability of reuse options; eg., returnable containers . Attitude toward the benefits of reducing waste . Convenience . Knowledge about and economic attractiveness of external reuse options (eg., deposit level)
	Make residuals available for material recovery and recycling	<ul style="list-style-type: none"> . Availability of material recovery options -- curbside source separation programs, depots, buy-backs . Knowledge about recovery programs available . Attitudes toward the benefits of reducing waste . Convenience of the program . Economic factors such as costs of engaging in the program or a monetary inducement involved (eg., buy-backs)

Table 2.1 (continued)

Sector	Decision	Factors Affecting Decisions
Commercial/ Industrial	Decrease residuals generated by:	
	. Decreasing quantity of materials used which become solid wastes during the commercial/industrial activities.	<ul style="list-style-type: none"> . Amenability of the commercial/industrial activity to decreased material throughput . Cost of waste disposal . Perceived impact on profit of decreasing materials purchased . Knowledge of opportunities available for decreasing quantities purchased . Attitudes toward the benefits of recycling wastes
	. Increasing internal reuse and recycling of residuals	<ul style="list-style-type: none"> . Amenability of commercial/industrial activity to internal reuse . Knowledge of opportunities available for reuse and recycling . Perception of the potential impact on profit of internal reuse and recycling . Cost of waste disposal and net savings from reuse and recycling
	Make residuals available for external reuse (eg., reusable containers and industrial pallets)	<ul style="list-style-type: none"> . Availability of reuse options; eg., returnable containers . Attitude toward the benefits of reducing waste . Convenience . Knowledge about and economic attractiveness of external reuse options (eg. deposit level)
	Make residuals available for material recovery and recycling	<ul style="list-style-type: none"> . Availability of material recovery options -- curbside source separation programs, depots, buy-backs . Knowledge about recovery programs available . Attitudes toward the benefits of reducing waste . Convenience of the program . Economic factors such as costs of engaging in the program or a monetary inducement involved (eg., buy-backs)

which goes against the primary thrust of most of today's commercial messages of life -- is affected by the consumer's attitudes towards waste, the availability of and information concerning opportunities for material reduction, and the convenience and economic attractiveness of these lower material-intensive decisions.

There are a number of opportunities for consumers to purchase goods which have a lower material intensity; a few include using reusable cloth diapers (via a service or in the home) rather than disposables, purchase of razor blades rather than throw-away razors, the use of cloth serviettes rather than paper. Consumers can also move to the use of commodities which have less packaging, including the adoption of bulk purchases, either in the regular retail store or the use of bulk food outlets.

Similar factors affect the decision to engage in the internal reuse of materials. Again, it is attitudes, availability and information about alternatives and the convenience and economic attractiveness of these options.

The largest impacts on waste generation are likely to be felt by home composting. Compostables constitute about 1/3 of residual waste. Currently, generators in the household have no direct economic disincentive for waste generation. Householders are not charged by quantity of waste. Consequently, attitude change, information and convenience are the most relevant levers.

Commercial/Industrial Generators

As Table 2.1 indicates, the decision to engage in reduction behaviour depends on the availability of reduction possibilities and the processes used, economics (cost of waste and perceived impact on profit), and information about the opportunities which are available.

Unlike the residential generator, much of the commercial/industrial sector has the direct economic incentive of avoided transport and disposal costs to act as an incentive.

However, experience with generators of liquid industrial wastes shows that lack of information and management inertia provide significant barriers to utilization of waste management approaches which are now, or could be, economically advantageous to the generator. The same may be true for a number of commercial/industrial concerns generating solid wastes, especially smaller ones.

It may be useful to use the model of initiatives that have been taken already in this area to provide support for waste audits and information distribution around waste reduction opportunities. It is noteworthy that the federal project in 1983-1984 which provided funds for employees to industrial firms to advise on waste management practices is reported to have

resulted in approximately one-third of those employees being hired full-time after the program was completed.

Consequently, suggested strategy for increasing reduction should focus on some combination of:

- . Encouraging the development of individual attitudes which are positive towards waste reducing behaviours
- . Increasing the availability and convenience of lower material options
- . Making these kinds of decisions more economically attractive to the generator.

Opportunities for Government Initiatives

The experience of a number of communities such as Ottawa-Carleton, Waterloo and Halton who are currently engaged in the process of acquiring a landfill, is that there is a heightened interest at the municipal level in reuse, reduction and recycling. This is doing two things. First, it is increasing the pressures from the municipalities on the provincial government to do something in the waste reduction and reuse area. Second, it is increasing the interest of municipalities in the viability of various incentives and disincentives for waste generation directed at the householder and the small commercial and institutional sector.

Decreasing service, imposing economic charges where they do not now exist, restricting the kinds of wastes acceptable by the municipality, and making behaviour such as source separation of wastes mandatory are all being discussed seriously in municipalities such as Ottawa-Carleton, which are currently going through the EA process.

The provincial government could assist municipalities in evaluating these issues by funding or undertaking reviews and assessments of the experience of jurisdictions implementing these measures.

The provincial government might also investigate legal and jurisdictional impediments to municipalities implementing these measures.

From an overall perspective, the government can focus on:

- . Change in attitudes: Changing attitudes is a difficult and long-term process. The forces working to perpetuate a consumer orientation are enormous. However, it may be argued that the time has never been more ripe for the provincial government to engage in an educational campaign to alter attitudes and behaviour relating to waste generation. Environmental concerns, especially around industrial waste, are extremely high. The receptivity to the "waste not" message may well be more positive and widespread than at any time in the past. The following kinds of initiatives could be taken:

- An overall campaign with a broad theme encouraging waste reduction, reuse and recycling, could be launched on an Ontario-wide basis. It could provide the underpinnings for the beginnings of a shift in consumers' attitudes towards reduction behaviour and add a major impetus for the growing recycling network across the province.*
- Education in schools. Schools are hungry for educational material relating to environmental themes. The time is particularly appropriate to place a more concerted effort in developing theme materials in this area.

The benefits of such efforts are likely to go beyond specific waste-reducing behaviours to include more receptivity to initiatives such as separation and special disposal of household toxics, pharmaceuticals, etc. In the medium to long run, if effective in increasing the constituency for products and practices which are waste-conserving, it will encourage industry to provide more of the kinds of products and services consistent with this environmental perspective.

- . Information: Information about the opportunities for reduction and internal reuse can be piggybacked both onto the overall campaign one described above and onto the source separation programs which are beginning to proliferate around the province. Both household and the commercial/industrial sectors should be included. Information provisions can include such things as the development of flyers, an information handbook (such as the Waste Handbook developed in Kitchener), and more innovative approaches such as the use of television to deliver the message. Home composting should be targeted. The Ministry's pamphlet on home composting could be enhanced and more widely distributed or an alternative form of transmitting the same information could be developed.
- . Availability and Convenience: It is difficult for the provincial government to have much of an impact on the general range of products offered by domestic and foreign manufacturers. However, the government's initiative in providing design awards for environmentally responsible packaging is one initiative which could be strengthened and extended. Home composting, the initiative with perhaps the greatest potential for reduction, can be made more readily available to home owners via a number of means -- municipal programs such as in Kitchener which provided composters free, on a trial basis, or at reduced rate, could be supported by the provincial government.

*See chapter 6.

One of the incentives suggested to encourage reduction via economic inducement was the product charge proposed for the United States. It received considerable study*. The idea was to impose a tax on materials which would reflect their disposal costs. At least three major studies were made of the proposal and came to the conclusion that, depending on the nature of the charge, recycling could receive major encouragement with an increase of about 7% but reduction would receive a very small inducement. Government initiatives to encourage improved product durability levels has not proven easy or particularly effective.

One should not be overly optimistic about the short-term effects of education and information. Programs sponsored by the Waste Management Advisory Board, and completed by RIS in Kitchener in 1983, monitored waste patterns in households before and after an educational program on reduction and reuse opportunities. The results showed minimal decrease on waste on average of approximately 1%; however, the study did show that those participating in a source separation program were more responsive than those who did not.

Attitude change is a long-term project.

Strategic Implications

The Ontario government has a range of opportunities available to attempt to increase reduction behaviour. While the task of changing attitudes must be seen in a long-term context, and the forces encouraging consumerism are strong, there are a number of reasons to believe that an Ontario initiative focussed on attitude changes now could have positive impacts.

First, the profile of the environmental issue is currently very high; waste issues being visible and of concern. (Secondly, interest at the municipal level is growing as more and more communities become involved in the Environmental Assessment and Master Planning processes.) Finally, the potential spread of a source separation network across much of Ontario** has enhanced the opportunity to piggyback the reduction message to both household and commercial/industrial sectors onto the source separation program. It also provides a concrete opportunity for individuals to do something visible and concrete. Significant, interactive and mutual reinforcing effects are possible: the reduction message can help to encourage reuse and recycling; and vice versa.

*See, for example, the 1979 report to Congress by the Environmental Protection Agency.

**See the Chapters on reuse and source separation

From a strategic perspective, a cross-Ontario media campaign with a "reduce, reuse, recycle" or similar message could provide a highly visible thematic and potentially effective unifier for the government's efforts in the 4Rs area.

CHAPTER 6

REUSE

Reuse involves such activities as the purchase and return of refillable beverage containers, and the use of the rental and used car markets. The benefits of reuse include the environmental, material and energy savings associated with decreased waste disposal.

Forces similar to those affecting the reduction decision are the most important influences on the household and commercial/industrial sector residuals generators. As Table 2.1 shows, attitudes, availability and information about reusables, convenience and economic attractiveness are important for the householder. For the commercial/industrial sector, economic considerations, availability of reuse systems and their amenability to specific commercial/industrial operations and information are the critical factors for commercial/industrial generators.

Most attention for increased reuse has focussed on container reuse with special emphasis on beverage containers. Since the Second World War, and especially since the middle 1960s, there has been a steady decline from virtually 100% reusable packaging system for milk, soft drinks and beer.

In general, there are a number of strong forces which have been pushing against reusable containers, the major ones being:

- . Heightened product competition through packaging differentiation; standard packages fit in well with reusable systems, but not with marketers' priorities
- . The economics of distribution: a one-trip container favours the economies of scale of centralized distribution
- . Retailer resistance to the inconvenience and cost of handling reusables
- . The appearance of new packaging materials which are highly attractive from a commercial viewpoint but which are non-refillable
- . Increased international trade in packaged commodities.

Ontario's Experience

- . Milk Containers: At the time of the Solid Waste Task Force's report, the three quart plastic refillable jug had over 40% of the milk

market in Ontario.* Today, none of Ontario's milk is sold in refillable containers.**

- . **Beer:** Historically, Ontario's beer distribution system has been dominated by the reusable container. The standard stubby bottle provided the basis for a system with a market share of well over 95% for refillable containers.*** However, this too has eroded. Current sales of beer in non-refillable cans stand at approximately 20% of packaged beer by volume.**** As well, the standard glass refillable bottle is being crowded out. A variety of long-necked bottles, some featuring twist-off caps, have appeared. These have proved to be much less durable; trippage rates are reported to have plummeted for these containers.
- . **Soft Drinks:** The Ontario government's existing soft drink container regulations were designed to encourage reusables by limiting the permissible range of non-reusable containers and specifying shelf space requirements for refillable containers.

When the regulation was originally proposed in 1975, the target was to have a system with 75% of packaged soft drinks in refillable containers. Currently, refillables are reported to have about 40% of total packaged soft drink sales in the province. Illegal containers, including PET plastic have appeared, underlining the fact that the regulation is presently not enforced effectively, and is perhaps not enforceable.

New container regulations have been discussed at some length. A proposal was made by the Alcan Aluminum Company to change the regulations to permit the introduction of currently prohibited containers. The essence of the proposal is that new containers would be permitted on the condition that certain recycling targets were met for non-refillables. Non-refillable containers would have to meet a recycling target or face penalties. It is suggested that the introduction of aluminum into the recyclable waste stream will improve the economics of source separation programs because aluminum commands a very high recycling price, making the attainment of such

*The Ontario government issued regulations during the early 1970s banning the three quart paper and three quart non-returnable plastic milk jugs in an attempt to halt the encroachment of non-refillables.

**The Ontario government's attempt to use moral suasion with voluntary compliance to bring on a refillable container at the time of metrication did not succeed.

***The Solid Waste Task Force reported non-refillable can sales were only about 2% in 1974.

****While the non-refillable beer can is returnable and commands a deposit, its deposit is currently 5 cents, one-half of the 10 cent bottle deposit.

targets more tractable. Refillable container shares could be guarded by specifying a certain minimum target and permitting encroachment into refillable share only if recycling targets were exceeded. Industry could, presumably along with government, provide funds to assist establishing the cross-provincial network required to meet the recycling targets.

At the time of writing, it appears highly likely that some version of this new container regulation will be adopted. Some observers see this as a major victory for recycling in the province; as the next chapter indicates, such an initiative must be properly prepared and supported or the cause of recycling may be not be assisted. Others believe that the system will inexorably lead to the demise of refillables in Ontario.

Strategic Implications

The general trend for container reuse seems clear; the decline in reusable containers is uniform across the continent. However, there are a number of measures which the government can take in the attempt to reduce this trend. The first priority is to protect and enhance those systems which exist. This could be done in two ways:

1. The government could engage in an education campaign aimed at directing consumer purchasing towards reusable soft drinks and beer containers, where they exist. This could be done in a number of ways. The first would be as part of the overall "reduce, reuse, recycle" campaign described in the previous chapter on reduction. The second vehicle could be the curbside source separation programs.

Unclaimed money from container deposits could be used to fund such a campaign.

2. The government's moral suasion, along with whatever leverage exists in linking the move, should it take place, of beer sales into other, non-Brewers' Retail outlets. The deposit level on the can could be raised to equal or exceed that of the bottle. Current public sentiment and the increased awareness generated by the promotional and informational campaign could generate the needed political support for leverage on the beer industry or direct government intervention to regulate the refillable container's share.
3. The government can use all available efforts to ensure that new soft drink container regulations do not result in the significant decline of the reusable soft drink container.

In the medium and longer term, the Ministry or the Environment could be preparing the ground and exploring opportunities to recoup some of the lost

ground including extensions to other containers.* The government could utilize the growing support at the municipal and local levels as leverage on the market players to move reusables back voluntarily and/or with regulatory force.

An initiative which would link in directly with the attempt by the government to use container regulations to enhance recycling, would require Ontario containers to be either reusable or recyclable. Such an initiative could have important symbolic as well as practical impact.

However, it would have to be carefully prepared and probably coordinated internationally. The problems faced by Ontario are encountered by the U.S., Europe and other industrialized countries. A significant initiative to move to a policy of reusable or recyclable packages would make most sense in the context of international initiatives. Ontario should liaise with the federal government and appropriate U.S., European and other international organizations on this matter with a view toward action in the longer term.

* The Ontario Waste Management Advisory Board made a number of recommendations concerning potential initiatives in wine and spirits, commercial industrial packaging systems among others.

Source Separation

7.1 Methods and Techniques

Source separation recovers recyclable materials before they become part of the waste stream. Currently, large volumes of ferrous metals, paper and glass are recovered by the existing secondary materials industry from large and medium sized industrial and commercial generators.

The residential sector and the small commercial, industrial and institutional sectors have a largely untapped potential for recovery. Because they are high cost sources of supply, sometimes requiring special recovery techniques, they have been ignored by the traditional recycling industry.

Over the past decade and a half, significant efforts have been made to implement programs targeted at the residential waste stream. Programs established primarily to access the residential sector normally draw on the commercial/industrial sector as well.* Table 7.0 shows the three primary techniques which are used in Canada and the U.S. for the residential sector. Variations on these are described in detail in Appendix 5.

For multi-material programs, recovery rates have been claimed for 5% to 15% of the residential waste stream.**

Newspapers, glass, and ferrous materials are the targets for the residential programs. Because of their direct contact with the householder, these programs might be used to encourage other waste diversion and reduction objectives as well -- home composting of yard wastes, recovery of problematic waste components such as waste oils and discarded pharmaceuticals.

7.2 Penetration and Momentum

Penetration

Single material city-wide collection systems operate in over 43 communities across Ontario. Approximately 30 have multi-material systems. Over 50% of the population currently has direct access to one of these programs.

*About half of the Kitchener program's paper fibre revenue is derived from corrugated paper originating in the commercial/industrial sector.

**Verifying these performance figures is difficult, given the range of generation estimation techniques used, normal fluctuations in the wastestream, and so on.

Table 7.0

Residential Sector - Regular Source Separation Programs

<u>Method</u>	<u>Basic Approach</u>	<u>Comments</u>
A. <u>Curbside</u>		
- Single material	- Pick up material on specified day usually newspaper only	<ul style="list-style-type: none">- Programs have limited diversion potential because single material only- Can be economic when market for news right- Skim off higher BTU content; lower energy content for EFW
- Multi-material	<ul style="list-style-type: none">- Pick up materials on specified day- may use special container to hold separated materials for householder- May use specialized vehicle to hold separate collection fractions	<ul style="list-style-type: none">- Greater potential for waste diversion- Can be less economic because glass and ferrous fraction not as lucrative- Have less negative impact on BTU content of remaining waste because divert portions of glass and ferrous fraction, which are inert
B. <u>Buy Back</u>	<ul style="list-style-type: none">- Location, often material processing centre, at which materials dropped off in return for cash	<ul style="list-style-type: none">- Saves on collection costs for operator- Appeals to monetary incentive- In principle, can be used for any recyclable material; in Ontario, has been primarily focussed on news, in U.S. aluminum can- can tap multiple dwelling units
C. <u>Depot</u>	<ul style="list-style-type: none">- Unmanned structure at which generators drop off some separated materials	<ul style="list-style-type: none">- Saves on collection costs but relies on high commitment from generator- Lower participation rates- Can be used in areas where curbside collection not feasible/economic- Tap multiple dwelling units

While the communities involved constitute a significant portion of Ontario's population, the amount of material actually recovered is relatively small.* Table 7.1 contains data on the population served and materials generated.

A few of these programs report high recovery levels of 10% or more of the residential wastestream. This indicates that multi-material programs can play an important role in the province's waste management system.

Tables 7.2 and 7.3 show the actors and decisions relevant to municipally-collected waste and industrial/commercial waste projects.

Momentum

Momentum for these programs has been building due to:

- . Ontario government initiatives. Information and start-up financing support has been central in establishing a number of the multi-material programs.
- . Highly visible demonstration. A number of initiatives in Kitchener, Halton, and elsewhere have shown that multi-material source separation can provide a functioning component of the solid waste management stream with high participation rates.
- . Landfill acquisition and the Environmental Assessment process. Municipalities going through the landfill acquisition process have come under intense pressure to reduce landfill requirements. Source separation is one of the central ways in which urban areas can divert waste from landfill. The EA process has put source separation front and centre as a technology that must be considered as a landfill supplement. It appears that municipalities engaged in the EA process are beginning to view a source separation program as one of the prices they may have to pay to "buy" a landfill approval.**
- . Market improvement. The market for used news has strengthened considerably with the opening of Ontario Paper's

*On the basis of most recently available statistics, total recovery from these programs is 46,000 tons. This constitutes about 2% of total residential wastes generated.

**This has been most clearly displayed in Waterloo, Halton and Ottawa/Carleton.

Table 7.1

Summary of Existing Municipally Based Source Separation Programs by County

Municipality	Pop'n. (1982)	Number of Households (1983)	Source Separation Program?	Quantity of Newsprint Diverted (Tons)	Quantity of Corrugated Diverted (Tons)	Quantity of Other Paper Diverted (Tons)	Quantity of Glass Diverted (Tons)	Quantity of Ferrous Metals Diverted (Tons)	Quantity of Plastics Diverted (Tons)	Quantity of Non-ferrous Diverted (Tons)	Quantity of Other Materials Diverted (Tons)	Total Diverted (Tons)
ALGOMA (DISTRICT)	124,816	46,913		0	0	0	0	0	0	0	0	0
BRANT (COUNTY)	98,996	37,188		0	0	0	0	0	0	0	0	0
BRUCE (COUNTY)	57,282	29,898		0	0	0	0	0	0	0	0	0
COCHRANE (DISTRICT)	86,308	31,701		0	0	0	0	0	0	0	0	0
DUFFERIN (COUNTY)	31,536	11,530		0	0	0	0	0	0	0	0	0
DURHAM (REGIONAL MUNICIPALITY)	288,153	102,635	E	1,714	182	133	51	28	0	0	0	2,108
ELGIN (COUNTY)	68,413	25,928		0	0	0	0	0	0	0	0	0
ESSEX (COUNTY)	311,441	118,836	E	1,375	1,694	500	0	0	0	0	0	3,569
FRONTENAC (COUNTY)	114,642	49,450		0	0	0	0	0	0	0	0	0
GREY (COUNTY)	73,427	33,836	E	108	0	0	0	0	0	0	0	108
HALDIMAND-NORFOLK (REG. MUN.)	87,211	35,857		0	0	0	0	0	0	0	0	0
HALIBURTON (COUNTY)	11,117	17,242		0	0	0	0	0	0	0	0	0
HALTON (REGIONAL MUNICIPALITY)	254,085	86,982	E	6,100	398	477	3,481	502	0	0	0	10,958
HAMILTON-WENTWORTH (REG. MUN.)	414,175	157,321	E	2,323	0	496	0	0	0	0	0	2,819
HASTINGS (COUNTY)	105,242	44,670		0	0	0	0	0	0	0	0	0
HURON (COUNTY)	57,694	23,539		0	0	0	0	0	0	0	0	0
KENORA (DISTRICT)	36,483	14,692		0	0	0	0	0	0	0	0	0
KENT (COUNTY)	104,231	39,834	E	80	0	0	0	0	0	0	0	80
LAMBTON (COUNTY)	120,641	47,322	E	240	164	0	24	0	0	0	0	428
LANARK (COUNTY)	45,129	20,953		0	0	0	0	0	0	0	0	0
LEEDS & GRENVILLE (COUNTY)	80,848	36,166		0	0	0	0	0	0	0	0	0
LENNOX & ADDINGTON (COUNTY)	32,440	14,104		0	0	0	0	0	0	0	0	0
MANITOULIN (DISTRICT)	6,850	4,506		0	0	0	0	0	0	0	0	0
MIDDLESEX (COUNTY)	327,788	129,013	E	2,424	0	0	0	0	0	0	0	2,424
MUSKOKA (DISTRICT MUN.)	36,746	34,155		0	0	0	0	0	0	0	0	0
NIAGARA (REGIONAL MUN.)	367,738	138,965	E	3,057	354	899	63	17	0	0	0	4,390
NIPISSING (DISTRICT)	73,850	27,532		0	0	0	0	0	0	0	0	0
NORTHUMBERLAND (COUNTY)	64,605	27,494	E	432	0	0	40	0	0	0	0	472
OTTAWA-CARLTON (REGIONAL MUN.)	562,782	222,473		0	0	0	0	0	0	0	0	0
OXFORD (COUNTY)	84,302	30,590	E	333	0	0	0	62	0	0	0	395
PARRY SOUND (DISTRICT)	29,753	22,842		0	0	0	0	0	0	0	0	0
PEEL (REGIONAL MUNICIPALITY)	506,421	175,277	E	305	0	0	49	0	0	0	0	355
PERTH (COUNTY)	65,712	23,879	E	202	48	26	37	0	0	0	0	313
PETERBOROUGH (COUNTY)	102,078	49,811	E	0	0	0	48	3	0	0	0	51
PRESCOTT AND RUSSELL (COUNTY)	52,621	18,806		0	0	0	0	0	0	0	0	0
PRINCE EDWARD (COUNTY)	21,966	9,794		0	0	0	0	0	0	0	0	0
RAINY RIVER (DISTRICT)	19,756	8,011		0	0	0	0	0	0	0	0	0
RENFREW (COUNTY)	86,461	35,695	E	79	0	40	0	0	0	0	0	119
SIMCOE (COUNTY)	217,536	96,302	E	28	0	0	0	0	0	0	0	28
STORMONT-DUNDAS-GLENGARRY (C)	100,121	37,141		0	0	0	0	0	0	0	0	0
SUDBURY (DISTRICT)	18,586	7,159		0	0	0	0	0	0	0	0	0
SUDBURY (REGIONAL MUN.)	157,856	56,145		0	0	0	0	0	0	0	0	0
THUNDER BAY (DISTRICT)	141,856	53,462		0	0	0	0	0	0	0	0	0
TIMISKAMING (DISTRICT)	37,316	14,781		0	0	0	0	0	0	0	0	0
TORONTO (MUN. of METRO)	2,140,347	837,207	E	8,101	7	205	777	128	0	0	0	9,218
VICTORIA (COUNTY)	48,724	27,043		0	0	0	0	0	0	0	0	0
WATERLOO (REGIONAL MUN.)	570,726	208,102	E	3,075	2,023	191	677	347	0	0	0	6,313
WELLINGTON (COUNTY)	134,504	49,026	E	346	0	0	21	0	0	0	0	367
YORK (REGIONAL MUNICIPALITY)	266,128	93,816	E	963	159	52	198	7	0	0	0	1,379
ONTARIO	8,847,439	3,465,424		31,285	5,028	3,019	5,468	1,094	0	0	0	45,893

Table 7.2

Source Separation - Industrial/Commercial Collected Waste

The Decision: Set up and Operate a Source Separation Program Utilizing Industrial/Commercial Wastes

Actors Directly Involved in Decision

Source separation operator

Commercial/Industrial source of waste

Nature of Decision

- Start up and operate system?
- Permit proponent access to wastestream
- Provide active economic support (Portion of disposal fee?)

Contributive Actors - Actors Influencing Decision

Markets for separated wastes

Provincial governments
. Ministry of Environment
. Other Ministries

Federal Government
. Environment
. Finance
. Other departments

Waste management companies

Interested/affected public

Public interest groups

Municipal government

- Accept waste generated by program: quantity & price?
- Provide active economic or other support to program or markets?
- Provide active economic or other support to program or markets for separated wastes?
- Cooperate with program?
- Support program? Provide financial credit?
- Provide active support to program
 - Publicity, etc?
- Charge for waste at disposal site? How much?

Table 7.3

Source Separation - Municipally Collected Waste

The Decision: Set up and Operate a Source Separation Program Utilizing MSW

<u>Actors Directly Involved in Decision</u>	<u>Nature of Decision</u>
Source separation operator	- Start up and operate system?
Municipal government	- Permit proponent access to wastestream
. area municipalities	- Provide exclusive rights/anti-scavenging protection for program operator
. Regional Municipality/County	- Provide active economic support (Diversion credit)?
<u>Contributive Actors - Actors Influencing Decision</u>	
Source of separated waste (householder, etc.)	- Participate in program; supply waste?
Markets for separated wastes	- Accept waste generated by program: quantity & price?
Provincial governments	- Provide active economic or other support to program or markets?
. Ministry of Environment	
. Other Ministries	
Federal Government	- Provide active economic or other support to program or markets?
. Environment	
. Finance	
. Employment and Immigration Commission	
. Other departments	
Waste management companies	- Cooperate with program?
Interested/affected public	- Support program?
Public interest groups	- Provide active support to program - Publicity, etc?

deinking facility. Glass and ferrous markets have improved as well,* in part, because of the pressure generated around the soft drink packaging issue.

These programs are popular with the public in many parts of the province. This popularity has strengthened two other forces at work to assist the promotion of source separation:

- . Solid waste management company involvement. Laidlaw has used their recycling program as a marketing tool to win waste management contracts. They believe this gives them an edge over their competition of what they perceive to be strong public support for recycling. Other firms are beginning to offer the same service.
- . Pressure on municipal officials. Even municipal politicians who are not faced with a landfill site acquisition problem** are currently feeling increased pressure to incorporate recycling in their solid waste management systems.

7.3 Success Factors for Source Separation Programs

An individual organization playing a catalytic role is required to initiate these programs. But for multi-material programs to be a reliable component of the solid waste management system, they must have a sustainable economic base.*** Figure 7.1 sketches source separation's main economic components.

Program economics are highly variable. Distance to market, and the availability of suitable quantities of waste are critical variables. Other key factors are:

- . Participation Rates: High participation rates, which require proper education and a lead time to establish are essential for acceptable material flow.****

*For example, ferrous prices used to be about \$20. They are currently in the \$70 range. Glass beneficiation facilities have been installed and prices have risen.

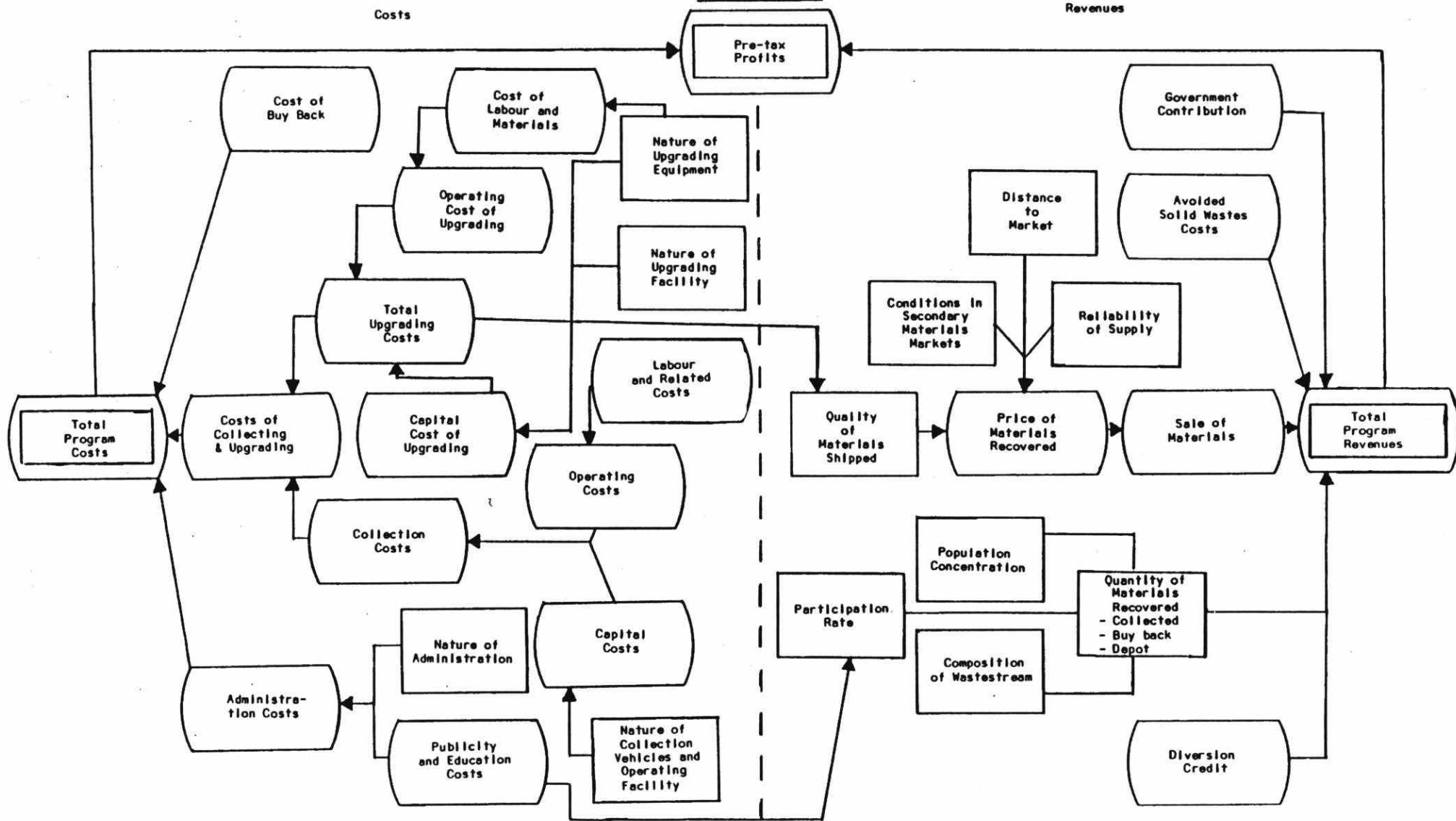
**For example, in London and Metropolitan Toronto.

***Newspaper collections in the past have proved viable with favourable news market conditions, but they provide a relatively low level of diversion from landfill and are unreliable without ongoing municipal support.

****These rates can differ from material to material -- news participation might be 80% but glass and cans significantly less.

Figure 7.1

Source Separation Programs
Economic Elements



- . Markets: A reliable outlet for materials at a sustainable price.
- . Collection and Processing Costs: Efficient collection methods are needed to keep costs down.

7.4 Barriers to Current Program Viability: Building a Sustainable Economic Base

Data on program costs submitted to the Ministry of the Environment indicate that currently mature multi-material programs are not economically self-sustaining. While programs vary considerably, on average, they appear to need about \$15 per ton as a diversion credit and/or some other form of financial contribution under current market conditions.* Consequently, to sustain these programs, one or more of the following will be required:

- . A diversion credit from the municipal authority
- . Improved program efficiency
- . Higher materials prices
- . Ongoing outside financial support.

7.5 Diversion Credits -- A Key to Program Viability

An increasing number of municipalities have offered diversion credits. Peel and Hamilton/Wentworth provide \$4.40 per ton; Metro Toronto pays \$5. Halton will be providing two-thirds of the tipping fee in the coming year (this will come to approximately \$17 a ton).

7.6 Concerns About Program Expansion

Municipalities that are currently not involved in programs, and that are not involved in the process of landfill acquisition, have shown reluctance to become involved, primarily for economic reasons. Many state that while it is true that there is building public pressure for these programs, municipalities will also be expected to keep the waste management budget down. They are loathe to take on the Ministry's subsidy program because it will mean higher subsequent costs for which they will be held accountable. They will have to come up with the money to maintain the funding for these programs if they are not self-sustainable when the Ministry's funding terminates. Many of

*Because the current Ministry of Environment program covers program losses, the figures may understate true economic viability. See Appendix 5 for details.

these municipalities do not perceive the economic savings are commensurate with the commitments they would have to make.

Markets have been a major concern with program operators and municipalities. Many municipalities became involved in recycling programs in the 1970s, only to have the bottom fall out of the newsprint market. Over the past decade there has been significant variation in all of the materials' prices.*

News prices are central to program economic viability. Typically, over half of the multi-material programs' revenues depend upon the sale of news. While many agree that the news market has stabilized with the development of Ontario Paper's deinking facility, there is concern that a greatly increased recycling effort would not be supported. There is evidence that current markets are about in balance and increased supply could precipitate (significantly) lower prices. Indeed, downward pressure on news prices appears to have begun. An additional ongoing concern is the influence of the huge U.S. supply.

Short term concerns about program expansion also include the lack of adequately trained and experienced program operators and the need for capital investment to make these programs work properly. These concerns are particularly heightened by the potential impact of the proposed changes in soft drink container regulations.

Soft Drink Container Legislation and Program Expansion

The introduction of the regulatory changes discussed in Chapter 6 could encourage a major expansion in source separation across the system. Recycling targets for non-refillable containers would be the driving force. For this to work effectively, however, recycling targets must be effectively enforced, and the market for recovered materials must provide a stable economic underpinning for the system.

Thus, market concerns are central. The rumoured container legislation appears to have incentives built in for the markets receiving packaging materials to provide a stable market, since meeting their recycling target depends upon it. However, news, which is critical for ongoing program viability, has no such incentive.

Historically, news markets have fluctuated, primarily due to market forces. The implementation of an extensive source separation system which "cannot" be permitted to fail because of its waste management role and importance for the packaging industry adds another major factor for potential destabilization.

*News has ranged between \$9 and \$90 per tonne (FOB baled, recoverer's yard), tins \$0 to \$65 (FOB recoverer's yard), glass \$23 - \$45 (FOB end user's yard), old corrugated containers \$18 - \$68 (FOB end user's yard).

News quantities will increase. Even more importantly, the opportunity for the users of news to keep prices down will grow significantly. The market is highly concentrated. Purchasers of news who recognize that governments and packagers are committed to maintain the system, through ongoing economic subsidies, if necessary, are in an excellent position to keep news prices low. This dramatically underscores the need to expand and diversify the news market in Ontario.

7.7 Strategic Considerations

Public Support

Support for source separation programs appears to be very strong across the province. There are few concerns about the implementation of the technology, beyond its economic requirements. Some municipal officials believe that source separation program adoption is now necessary to "buy" a landfill from local landfill opponents.

Inclusion of Other 4Rs

As mentioned above, the source separation program can be used to deliver information and other material aimed at encouraging reduction and reuse. The Kitchener program indicates that it may be possible to piggyback an effective home composting initiative onto it.

Rising Expectations and Ministry Participation

If the Ontario government encourages these programs by subsidizing them beyond a pilot phase in selected communities, it will raise expectations of ongoing viability. Should it decide to do so, the Ministry must be willing to live with the consequences of having created a widespread system. Long term market issues and the assignment of risks and responsibilities among the key players -- program operators, the markets for secondary materials, the municipalities -- become a central concern. The proposed soft drink container regulations changes heighten this.

Market Development

Short-term markets appear relatively strong, though beginning to show weakness in certain areas.* Long-term viability is uncertain; a major decline in the market for newsprint could jeopardize a large part of the current carefully constructed edifice of multi-material programs. The possible extension of the provincial system based on the new soft drink container regulations renders even more urgent the increase, and

*The recent price offered for news for the prospective Mississauga recycling program was under \$20/tonne.

especially diversification, of the news market. The province should seriously consider a number of measures for news and other materials such as plastics and waste oil whose markets are currently weak, including:

- . Using moral suasion and related efforts to encourage greater use of recycled materials by the existing or expanded Ontario industry (e.g., the opening of a new deinking facility, the use of small quantities of news undeinked in existing processes).
- . Increasing financial assistance and tax incentives to secondary materials using industries. It can be argued that current and past government policies have fostered virgin material use.* Secondary materials support would help redress this. Direct grants may be the most effective way to increase secondary material development.
- . Further promoting consumer education to purchase products manufactured with recycled materials.
- . Funding or directly undertaking R&D on new product development.
- . Exploring the use of market stabilization mechanisms, such as buffer stocking schemes operated by some combination of program operators, municipalities and provincial governments.

Nature of Economic Assistance

Improved program efficiencies will make the programs more resilient and decrease their need for incentives. Government incentives should encourage program efficiencies; the current approach of funding losses provides no direct incentive to do so.** A different approach could be taken -- e.g., a tonnage-based grant, or a capital-related contribution. Assisting research, development and demonstration (RD&D) efforts for new initiatives to promote program efficiency could also help.

*For example, the provincial government's past forest policies which have resulted in lack of adequate reforestation raises serious concern about the ability of the Ontario forests to support the forest industry in the future. Priorities for northern development (including the pulp and paper modernization initiatives through BILD) and provincial transport policy may also be pointed to.

**It also creates the problems for projects seeking outside financial support. Because they are not able to show a profit line, they can find it difficult to obtain a line of credit.

Extension of Program to Other Materials

Opportunities for extension of the program to other materials, such as waste oil* and household hazardous products and pharmaceuticals should be continuously explored because of their environmental implications. Increases in plastics and other waste stream composition changes such as the increase in laminates, suggest that new challenges will be constantly faced by programs attempting to tap a significant portion of the waste stream. Continuing support for promising RD&D initiatives to deal with new waste stream components would help.

*The federal government's apparent withdrawal from this program offers the Ontario government with an opportunity to pick it up and perhaps tie it directly into the source separation programs across the province.

CHAPTER 8

Energy from Waste

8.1 Technology to Convert Solid Waste into Usable Energy

The technology has been in use for decades around the world. There are dozens of plants in the U.S. and hundreds in Europe and the Far East. A variety of viable technologies have been developed for both small and large installations.*

EFW economic performance varies considerably from application to application. The nature of the energy load, the price obtained for the recovered energy, the characteristics of the wastestream, and tipping fee revenues all have a primary influence on economic attractiveness. Markets for the energy produced by these facilities are typically large industrial and institutional steam users, and the electrical grid.

The technology is mature enough and its costs sufficiently well-defined for EFW to offer a technically viable solid waste management alternative for Ontario.

8.2 Penetration and Momentum

Interest in EFW has been very high in Ontario for the past 5 years. A number of municipalities and private sector companies have looked seriously at the technology. Government-funded studies, and trips to the U.S. and Europe to view working installations have dramatically increased the amount of information and interest in EFW.

Private sector companies attracted by perceived opportunities in the EFW area have emerged in Ontario and have demonstrated the ability to put EFW projects together: for example, Petro-Sun, Enercan, Fenco, Trintek and Tricil.

Ford at Oakville has recently installed a small EFW facility to burn internally generated wastes. Victoria Hospital in London has successfully made its way through the Environmental Assessment process and is about to begin construction of a 270 tonnes per day plant burning municipal solid waste.

A number of other projects are under active consideration and at various stages of development: the Laidlaw and Petro-Sun proposal at Waterloo,

*Refractory controlled air or mass-burning and rotary kiln technologies are most popular for installations under 360 tonnes per day. Water wall and suspension-burning are the technologies of choice for larger facilities. The energy can be converted to steam and/or electricity depending upon energy load and the relative attractiveness of steam and electricity prices.

the Domtar/Petro-Sun project in Peel, the proposed Windsor plant, the 3M project in London and the General Motors proposed plant in Oshawa.

Tables 8.1 and 8.2 show the decisions and actors active in these two kinds of projects.

8.3 Success Factors

The key ingredients for a successful project involving municipal solid waste were displayed by Victoria Hospital's experience.* These are:

- . A proponent willing and able to take the EFW project through the approvals process.
- . An energy user willing to participate in the project and to follow it through to completion.**
- . A municipal council willing to support the project and follow it through the approvals process.

The preconditions for these three factors were an adequate incentive level for all of the project participants. For both the proponent and the municipality, economics were the prime consideration. Support from the federal government's FIRE program, the Ontario government's capital contribution and loan from BILD, and the tax advantages provided by Class 34 to the financier were all important ingredients in providing the needed incentive level.

For Ford at Oakville, the key was project economics. The FIRE program supported the project with a capital grant. The project utilizes internally generated wastes; the municipality was not involved as proponent or waste supplier. Consequently, no Environmental Assessment was required. The project proceeded through the Environmental Protection Act without major controversy.***

*See Appendix 4.3 for detailed description of the Victoria Hospital project.

**In Victoria Hospital's case the proponent was the energy user.

***The lack of a hearing may partially explain this. No hearing is required under EPA. It appears that the project was not well known to the public until after approval was granted. A public meeting was held after the issue had been decided. However, it should not be concluded from this that it is necessary to avoid a hearing to gain approval. The 3M project in London had hearings under the EPA and was subsequently approved.

Table 8.1

Energy From Waste - Municipally Collected Waste

The Decision: Set up and Operate an EFW Program Utilizing Municipally Collected Waste

Actors Directly Involved in Decision

Project proponent*

Municipal government

- . Area municipalities
- . Regional Municipality/County

Energy user

Government Approval "Agencies"

- . EAB/Consolidated Hearings Board,
under EA or Consolidated Hearings Act

Nature of Decision

- Invest in and operate EFW plant?
- Provide waste to project? What quantities,
conditions, price?
- Serve as market for energy? What quantity, price?
- Approve project? With or without conditions?

Contributive Actors - Actors Influencing Decision

Provincial government

- . Ministries of Energy and Environment
- . Other Ministries

Interested/affected public

Federal government

- . EMR
- . Other departments

Public interest groups

- Provide economic or other support to project?
- Change regulatory environment?
- Intervene in EA process? Support project?
- Provide economic or other support to project?
- Intervene in EA Hearings process? Support project?

*Note: Project proponent can be an energy service company, equipment supplier, municipality, energy user, alone or in consortia or partnership.

Table 8.2

Energy From Waste - Individual Source of Waste

The Decision: Set up and Operate an EFW Program Utilizing a Dedicated Source of Waste (eg, Industry)

Actors Directly Involved in Decision

Project proponent*

Energy user

Government Approval "Agencies"

- . EAB, under EPA unless designated under EA

Nature of Decision

- Invest in and operate EFW plant?
- Serve as market for energy? At what quantity, price?
- Approve project? With or without conditions?

Contributive Actors - Actors Influencing Decision

Provincial government

- . Ministries of Energy and Environment
- . Other Ministries

Interested/affected public

Federal government

- . EMR
- . Other departments

Public interest groups

Municipality

- Provide economic or other support to project?
- Designate project under EA?
- Change regulatory environment?
- Intervene in EPA Hearing (if convened)? Support project?
- Provide economic or other support?
- Support project? Intervene in EPA Hearings (if convened)?
- What charge for waste at disposal sites?

*Note: Project proponent can be an energy service company, equipment supplier, energy user, alone or in consortia or partnership

8.4 Factors Affecting Future Project Implementation

Project Economics -- Plants Using Municipal Solid Waste

Economic attractiveness varies greatly from project to project. Figures 8.1 and 8.2 show some of the key influencing factors. In Appendix 4 project economic analysis is undertaken using some typical figures for cost, plant performance and other critical factors. Assuming a private sector proponent, no government grant, a 15% discount on saved natural gas prices to the energy user and a hurdle rate of return to the proponent* of 15% to 20% after tax on equity, in the most favourable case, projects producing steam will be attractive only if the tipping fee is at least \$25. Most projects will require a significantly higher tipping fee than this. For new electricity producing plants dumping their output into the grid, the required tipping fee is much higher -- generally \$50 or more.

While some municipalities are charging tipping fees in this vicinity,** it is not clear that avoided costs associated with EFW installations are nearly this high.***

Some combination of the following will therefore be necessary to make these projects economically attractive:

- . A better economic fit
- . Government economic incentives
- . Municipal willingness to pay a tipping fee premium - ie. more than avoided solid waste management costs.

Rising energy prices would improve the economics of these applications. But at currently projected rates of increase, the shift is not likely to be significant. As the analysis in Appendix 4 shows, the Ministry of Energy's assumed 1995 price for natural gas would decrease tipping fee requirements only by about \$2 per tonne.

Energy users with proper load characteristics and the willingness to participate and pay an acceptable price for energy are often difficult to find.

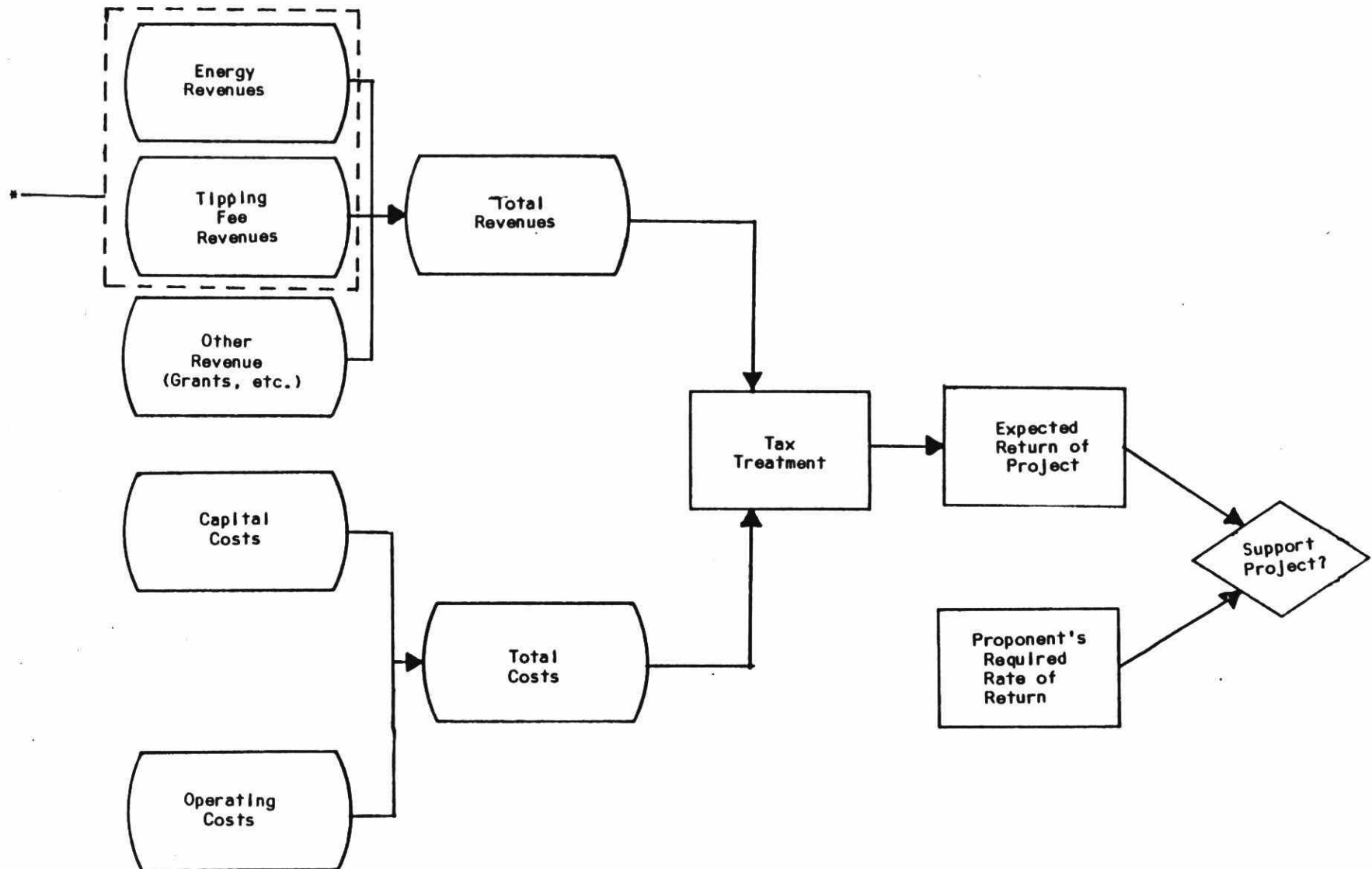
*The hurdle rate is the minimum internal rate of return required for the project proponent to proceed.

**For example, Halton currently charges about \$25 per tonne.

***See Appendix 1.

Figure 8.1

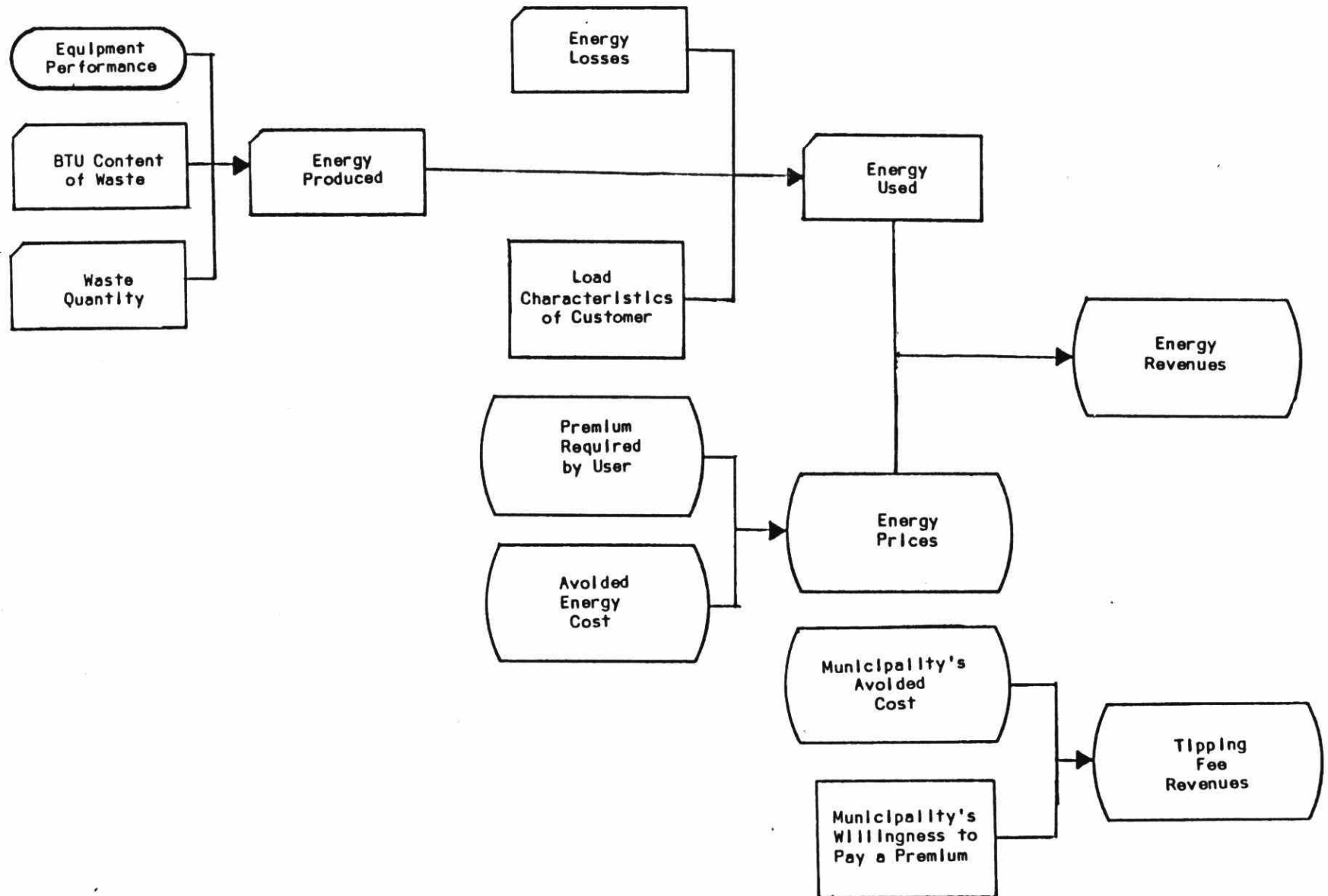
Factors Affecting EFW Economics and Proponent's Decision to Support Project



*See Figure 6.2

Figure 8.2

Factors Affecting EFW Energy and Tipping Fee Project Revenues



Project Economics -- Using Industrial/Commercial Waste

Plants utilizing internally generated industrial/commercial waste can be much more economically attractive. No Environmental Assessment is required; costs of EPA approvals have been much lower than those under EA. The waste usually has a much higher BTU content than municipal solid waste,* and the firm saves on disposal costs -- both the tipping fee charged by the municipality and savings in haulage costs. The disposal savings to the firm are generally much higher than the avoided costs to the landfill operator.

Emissions and the Issue of Plant Siting

EFW Plants are the source of a number of air emissions -- heavy metals, particulate, SO₂, NO_x, HCL, and so on. They also involve increased traffic with attendant noise levels. As such, they are much like a typical industrial plant, and engender a similar kind of response from those likely to be affected by them. Local opposition to these plants is to be expected on this basis.

However, concern about EFW facility emissions has broadened beyond a local "NIMBY" focus because of the presence of dioxins. Since the Environmental Assessment at Victoria Hospital, the issue has gained considerable profile. Concerns have been raised about plant emissions performance and Ministry standards and enforcement. Some promising projects, such as that proposed for Halton, have been stalled in part because of public concern about these emissions. The Ministry of the Environment will fund pre and post operational monitoring of air emissions for the London Victoria Hospital project. The Ministries of Energy and the Environment have co-funded tests of selected municipal solid waste incinerators. The federal government's NITEP program is currently testing emissions from a number of plants.

Some public interest groups, such as Pollution Probe, have urged caution on further EFW installations pending NITEP results and a longer term program to better define the relationship between waste composition, incinerator operating conditions and plant emissions. They have also questioned the acceptability of the government's provisional guideline and proposed standard for dioxins.

8.5 Strategic Considerations

- . The federal government's commitment to continuing financial support to projects in this area has changed dramatically. No further FIRE grants are being allocated. While Class 34 has

*7,500 BTUs or more as compared to about 4,500 BTUs for municipal solid waste.

been given an indefinite extension, its future is still uncertain.

- . There are a number of municipalities in Ontario with solid waste management problems for which EFW could play a significant role -- e.g., Peel, Halton, Waterloo -- and who have made a commitment to significant levels of waste reduction.
- . FIRE grant commitments providing potentially critical leverage have been made to the Petro-Sun/Domtar project in Peel and the 3M project in London.
- . The economic performance of MSW plants necessitates a significant tipping fee premium or government grants.* The political will required to provide this will have to be assured by confidence that the plants will perform in an environmentally acceptable manner at the selected site.

Measures to address the environmental concerns could entail:

- . The development of public information material outlining and explaining the government's approach to environmental regulation and standard setting
- . A public review of the provisional guideline and proposed standard for dioxin
- . A public review of the government's overall approach to setting standards for air and water emissions
- . An ongoing research and evaluation program on waste incineration aimed at clarifying the relationship between waste composition, operating conditions and plant emissions. The incinerator ash issue could also be explored in more depth.** This might be done in conjunction with the federal government, building on the results of NITEP. It could be done through universities or independent research agencies -- a "centre of excellence" on incineration
- . The decision to offer no economic assistance to more plants pending a thorough and satisfactory assessment of NITEP results and any further testing deemed necessary.

*Or a very special proponent or economic fit. See Appendix 4 for details on sensitivity analyses for key economic variables.

**The environmental characteristics and classification of ash arose at the Victoria Hospital Hearings. This could be an area of controversy in the future.

Measures to address the monitoring and enforcement concerns could include:

- . Ministry commitment to monitor all EFW plants as it agreed to for Victoria Hospital.
- . Encouragement of the kind of shut down arrangement negotiated between Peel and Petrosun.

The support options for EFW include:

- . Continue to fund projects on "as needed" basis.
- . Continue to provide information support: fund feasibility studies, etc.
- . Provide alternative financial incentives to FIRE and Class 34 (if the latter disappears).
- . Develop a provincial vehicle to develop and fund projects.
- . Encourage R&D and demonstration for promising new technologies.

Active market development could also be utilized:

- . Make provincial government facilities active potential markets.
- . Ontario Hydro as an active "fall back" market.

CHAPTER 9

Centralized Material Recovery and Composting

9.1 Centralized Material Recovery

Technology

Central material recovery involves the sorting of materials after collection to produce recyclable materials, residue which can be directly converted into energy or marketed as a refuse-derived fuel (RDF) and/or compost. The input is generally unprocessed municipal solid waste. Mechanical recovery is the approach which has been most generally adopted. However, the example of a system relying on manual separation in St. Catharines has aroused considerable interest. This system will be discussed as well.

Mechanical Recovery

The basic design for most mechanical recovery plants includes some combination of presorting to remove large objects and quantities of materials that are easily segregated such as corrugated containers, tromelling, shredding and mechanical separation.

Typical plants constructed in North America during the 1960's and 1970's relied on extensive mechanical processing. The system developed by Cechini is a variation on this theme relying on less processing.

Another system developed by Black Clawson uses a wet approach which was originally aimed at producing an output which could be utilized in the paper industry. Currently the process is aimed at production of a marketable fuel (RDF).

The Ontario government's experimental resource recovery plant at Downsview, an example of the North American approach, recovers cardboard and ferrous metals, and produces refuse derived fuel (RDF) and compost. Material received is put through a manual separation phase to remove cardboard and non-processable or potentially hazardous materials. The residue is shredded, air separated and air classified. The heavier fraction passes through a magnetic separator to remove ferrous metals; a revolving screen removes fines (rich in glass); secondary shredding and air separation divides rejects from the material that passes on to be used as a feedstock to produce compost. (Compost will be dealt with in section 9.2.) The plant handles about 150,000 tonnes per year. A significant component of this is transferred directly to landfill.

While a number of the U.S. plants which were constructed over the past 15 years have shut down, some have been built relatively recently. For

example, the Newcastle County Reclamation Project in Delaware, which has been operational since April 1984, has the capacity to process about 900 tonnes of solid waste with a capacity to expand to 1,800 tonnes and about 320 tonnes of sewage sludge per day. The projected percentage output of materials is given in the table below:

RDF	46%
Humus	16%
Ferrous Metals	8%
Non-ferrous Metals	1%
Glass	8%
Internal Fuel	4%
Residue	4%
Lost in process	10%
(conversion of solids to gases in the digester)	

This plant will eventually burn the RDF on-site to produce electricity.

Economics

Plant economics are hard to predict for the Ontario setting. Apart from the Downsview plant, which is a demonstration project not scaled to commercial size, there is no Ontario experience upon which to draw.

Projected costs for the Delaware Project approximately \$18.00 per tonne, including about \$12.00 for debt service (1983 US dollars). The Downsview Plant cost \$15 million to build in 1977. This could cost \$30-40 million to construct today (1984 Canadian dollars). Current operating costs of the Downsview facility are in the \$50 range for the portion of the facility undertaking mechanical separation; low-tonnage throughput renders these costs unrepresentative.

There are indications that these plants are less economic than EFW facilities. Much depends upon the market for recoverable materials, with RDF being the key. The relatively undeveloped nature of these markets makes economic projections risky.

Manual Recovery

A resource recovery approach emphasizing low technology has been utilized in St. Catharines. The emphasis of the approach is manual sorting. Refuse is loaded onto conveyor belts; old corrugated containers are removed by hand. Contents of garbage bags are spread by hand rakes over conveyor belts after they have been slit open by automatic knives. The smallest articles are separated out through a series of trommel screens and shakers; smaller fragments are routed to

trucks for compaction and shipped off-site. The current destination is The Occidental Chemical Company's energy-from-waste facility in Niagara Falls, New York. Magnetic separation is used to segregate the ferrous metal components, after which recyclable paper is manually sorted.

The plant handles about 75,000 tonnes per year. Of this, approximately 2.8% is recovered cardboard, 1.5% is news and 1.7% is recovered metal. Of the rest, 63% is shipped to Occidental and 31% is landfilled. Plans for a composting operation have not materialized.

In reality, then, the process does very little resource recovery - only 6% is recycled. Difficulties have been reported in marketing the recovered materials due to quality problems.

The facility is run by Rob Ran (Hugh Cole), a private contractor who has a long-term contract with the City of St. Catharines. The city pays the contractor a fixed price per tonne of waste which is not landfilled - currently approximately \$16.00 per tonne. The contractor also receives about \$1.50 per tonne for materials landfilled. Little concrete data is available on the facility's operation. Capital cost estimates for building such a facility vary between \$300,000 to \$5,000,000. No data is available on the revenues and operating costs.

The key to the facility's operation, which is essentially that of a transfer station, appears to be the favourable tipping fee obtained from Occidental. At the time of writing, the resource recovery facility was non-operational. No firm plans appear to exist to reopen it.

Factors Affecting Implementation

Many of the same actors involved in the EFW and source separation are of course directly connected with the adoption of resource recovery: the municipal government; purchasers of the recovered materials, including RDF; and government approvals agencies. The project proponent can be a private sector operator, a municipality or a joint venture involving the municipality and the private sector.

The major barriers for centralized recovery systems are:

1. Perceived technological risk. Due to equipment problems - e.g., conveyor malfunctions, shredder explosions - and other problems related to gaining adequate separation of materials (glass segregation has proved to be a particular problem), the process has been perceived to be unreliable by Ontario municipal decision-makers. The Ontario government's Experimental Resource Recovery Plant has not overcome this impression. Several plants in the U.S. have shut down and now serve essentially as transfer stations.
2. Market risk. The RDF market is perceived to be underdeveloped. The Ontario government has been working through the ERRP to rectify

this. Serious interest by companies such as St. Lawrence Cement, indicates that these efforts may come to fruition. However, facility costs are high enough to make the uncertainty of the RDF market a decisive consideration.

Concern about these risks was the primary reason for the lack of municipal take up of capital grants and loans offered by the Resource Recovery Program.

9.2 Centralized Composting Facilities

Technology

Composting involves the biological decomposition of waste into a humus-like material which can be used as a soil conditioner. Centralized composting is practised extensively around the world, especially in areas such as Europe and Japan. In Germany, over 700,000 tonnes of waste are processed into compost annually.*

Most of the composting that takes place in North America involves sewage sludge; Windsor, Ontario is an example. There are examples of facilities composting solid waste however - the Delaware Resource Recovery Facility described above composts both solid waste and sewage sludge.

Compostables, which include yard and food waste, comprise about a third of the municipal solid waste stream. Consequently, the potential diversion from landfill is significant with this potential in mind. Middlesex County in New Jersey is promoting the use of composting. The Department of Solid Waste Management has a campaign to introduce composting into about 25% of the County's municipalities.

In order for the composting to be effective, undesirable components of the waste stream must be removed before the process begins. Thus, centralized composting is a back-end process for resource recovery which removes metals, glass and as much of the plastic component of the waste stream as possible.

There are two basic composting methods: open-air and in-vessel composting. Both involve blending, digestion and curing. Open-air composting is less technically complex, but involves larger land areas and can produce significant odour problems.

In-vessel composting (such as that done at the Downsview facility using a Fairfield digestion process) is more rapid. There are a variety of

*Of this, approximately 220,000 tonnes is solid waste, 55,000 tonnes is sludge, 300,000 tonnes of leaves and bark, and 140,000 of other kinds of waste.

alternative techniques available: rotating drum systems, stationary stack platforms, tunnel reactors, horizontal flow reactors (such as that at the experimental resource recovery plant) and vertical plug flow silos.

Economics

The Ministry of the Environment reports costs of approximately \$20.00 per tonne at its Downsview Plant. They state that this is at the high end of costs reported in other jurisdictions (\$8.00 to \$20.00). The Ministry asserts that an increase of at least 30% in its output is possible, which would reduce the cost to about \$14.00 per tonne.

Prices for compost sales vary considerably. The Ministry reports sales figures of \$4.00 to \$22.00 per tonne for compost which it has produced.

Factors Affecting Implementation

In other countries, one of the major problems confronting composting is the difficulty in establishing sufficiently extensive markets. Previously established markets have been hurt by the increased presence of plastics in the product which significantly decreases its attractiveness to customers.

The Delaware Project reports that the compost contractor (Fairfield) already has about 75% of the annual compost production under contract. The Delaware facility pelletizes about half of its product for marketing to the fertilizer industry. The unpelletized component will be either used as a hydro mulch - a lawn-seeding product - or for bedding in the poultry broiler house industry. Poultry growers on the eastern shore of Maryland have been targeted as a prime market. The facility intends to market the compost at a price which is competitive with the traditional bedding materials of woodchips and sawdust.

The Ministry of the Environment has been working to establish the composting market in Ontario. It reports, on the one hand, that it has "established the credibility of the product" and, on the other hand, that competitive pressures in the marketplace for compost have increased severely - products such as peat and screen topsoil have made it difficult to establish compost from municipal solid waste as a viable product. The Ministry's current plan is to involve the private sector in developing the market as much as possible. The Ministry reports that there are currently several users and the potential for large-scale reclamation projects.*

*See Peter Provias, "Composting of Municipal Solid Waste", 1982.

CHAPTER 10

Municipal Decision Making

Municipalities play a central role in solid waste management decision making. Their willingness to support source separation, material recovery and energy from waste is decisive for future implementation. They can also play an important part in encouraging reduction and reuse at the local level. We have concluded the following from our interviews with municipal officials.

10.1 The Nature of Municipal Decision Making

There are a number of key characteristics which heavily influence municipal decision making:

- . Service Providers: Most municipalities view themselves as service providers, administering the assigned legislation from the province on waste management and other activities to the citizens of their community. In doing so, they regard their proper role to provide efficient administration within the regulatory framework established by the province. They are risk averse, and generally non-entrepreneurial in their approach. Their perspective is generally local.
- . Least Cost Approach: Other things equal, municipal politicians will make their service-oriented decisions on the basis of budgetary constraints. This means the alternative which provides the least-cost approach to the level of service specified by the relevant regulations will be given preference.
- . Political Concerns and Controversy: The routine mold of cost-minimizing decision-making can be broken by an issue which is highly controversial. Politicians are influenced by constituent concern. When an issue takes on a high profile, a politician will not necessarily opt for the cost minimum alternative.
- . Participation and Pace: Much of the municipality's business is conducted in committee and on council in full view of the public, with invited participation from key affected groups. Decision making pace is frequently slow.
- . Politicians and Staff: Municipal staff turnover is generally lower than that of the politicians. Consequently, staff and staff attitudes can have a decisive effect on a municipality's general orientation and long-term course of action, especially when the service in question is administered routinely and not highly visible. Peer pressure can have an important effect on staff and politicians attitudes towards an alternative.

10.2 The Municipalities and Solid Waste Management Decision-Making

- . Traditional Attitude: Landfill was the preferred technology. The technology was well known and the costs were perceived to be relatively low. Source separation was viewed as trivial, because it could not provide much diversion potential, and unreliable, primarily because of market fluctuations. Energy from waste was considered to be expensive and technically risky.
- . Permissive versus Mandatory Decisions: The ends of solid waste management decision-making are prescribed by the province -- environmental standards, regulations, associated financial responsibility, etc. However, the means are left up to the municipality. Thus, in the absence of controversy, the municipality will pick the least cost route.
- . Profile of Solid Waste Management Decisions: Traditionally, solid waste management has been low on the list of municipal concerns. Its budgetary commitment is not large, in comparison with many of the other services provided by the municipality, and the day-to-day functioning of the system is generally non-controversial. However, this changes when the municipality is in planning mode.
- . Planning Mode: There are critical points at which the solid waste management attains a high profile and becomes a central focus for the municipality's concern. This is normally when the municipality is in "planning mode" for a new landfill. Because of the protracted nature of the process and the nature of the local concerns affected, solid waste management changes from being a routine to a highly charged issue. This has been heightened by EA. Source separation, EFW and other non-landfill alternatives now form a central part of the planning documentation prepared by municipalities seeking to acquire landfill approval.
- . NIMBY and Solid Waste Management Decisions: From a municipal perspective, there are two controversial solid waste management issues: landfill and energy from waste. In attempting to weigh the pros and cons of these alternatives, taking into account rural and urban interests, and attempting to deal with the complexities of environmental trade-offs, the municipalities are faced with complex and difficult decisions. Many councils feel beyond their depth in dealing with environmental issues and seek to refer to outside authority, e.g., the Ministry of the Environment. The Ministry's credibility is a critical issue for a municipality which seeks to rely exclusively on EPA standards and guidelines. Many municipalities feel there is a lack of adequate information on these trade-offs with which they can convince their constituents, and with which they themselves feel comfortable. Peel's approach to this problem may become the standard. It has insisted on environmental performance at Victoria Hospital levels. In its draft agreement with Petro-Sun, it specified the right to have the plant shut down if it exceeded the specified performance level.

10.3 Willingness to Support/Pay a Premium for Source Separation and EFW

To support EFW and source separation, therefore, the municipality needs:

- Assurance that the alternative is politically acceptable
 - . Significant (and active) support exists for alternative and/or:
 - . Community opposition to alternative not perceived to be critical:
 - alternative considered objectively safe: political representatives convinced alternative is a good one
 - opposition not generalized; opposition not influential with groups having decisive political clout within the community.
- Adequate economic incentive: project must require no more than municipality is willing to pay for alternatives. Willingness to pay depends upon:
 - . Perceived avoided cost associated with going to landfill alternatives
 - . Perceived strength of consensus that premium should be paid to encourage EFW or source separation. This depends upon:
 - strength of opposition to landfill/difficulty of obtaining approval
 - extent of political perception of responsibility to "do something with wastes other than landfill them". Peer pressure can be a critical supplement here
 - perceived desirability or undesirability of EFW or source separation; strength of that perception in key political constituencies
 - attitude of politicians and staff (independent of impact of public opinion)
 - perceived bargaining position with proponents.

Figures 10.1 and 10.2 show some of the influencing forces at work.

The avoided cost can vary significantly based on institutional arrangements and the local cost of haul and disposal:

- . Municipalities paying a tonnage-based tipping fee: Those area municipalities paying a tonnage-based tipping fee to the region, county, etc. will save the full cost of the tipping fee for each tonne diverted by the program. Normally, this amount will be the average cost of disposal or higher. For example, the Kitchener program is credited with about \$10 a tonne. This is usually higher than the actual savings to the disposal savings.* In effect, the municipality receives a credit higher than the actual savings obtained by the system.
- . Municipalities receiving actual disposal savings: Where the municipal authority operates the landfill, savings are likely to be lower than average costs.

The importance of municipal commitment to a source separation or EFW program for essentially non-economic reasons is highlighted by the Halton example. There, because of severe landfill restraints, the source separation program is being credited with what it "needs" to survive. The 1984 awarding of Kitchener's solid waste contract to Laidlaw at a higher price than its competition** shows public willingness in Kitchener to pay more for recycling.

10.4 Strategic Implications:

General Options

If the Province wishes municipalities to make more decisions in favour of source separation and EFW, it can, therefore:

- . Mandate the 4Rs
- . Change the regulatory framework to more heavily favour the 4Rs without mandating them***
- . Provide economic incentives
- . Make waste disposal a provincial responsibility and implement the 4Rs as it deems appropriate.

*See Appendix 1 for details, section 3.

** The competing firm offered recycling, but not on the firm contract basis offered by Laidlaw.

***For example, Section 28 of the Environment Protection Act may require revision to permit municipalities to establish "reserve" funds for future waste management projects which reflect 4Rs objectives and which capture true waste management costs.

Municipal Support for Source Separation (SS)

(Landfill Acquisition Phase)

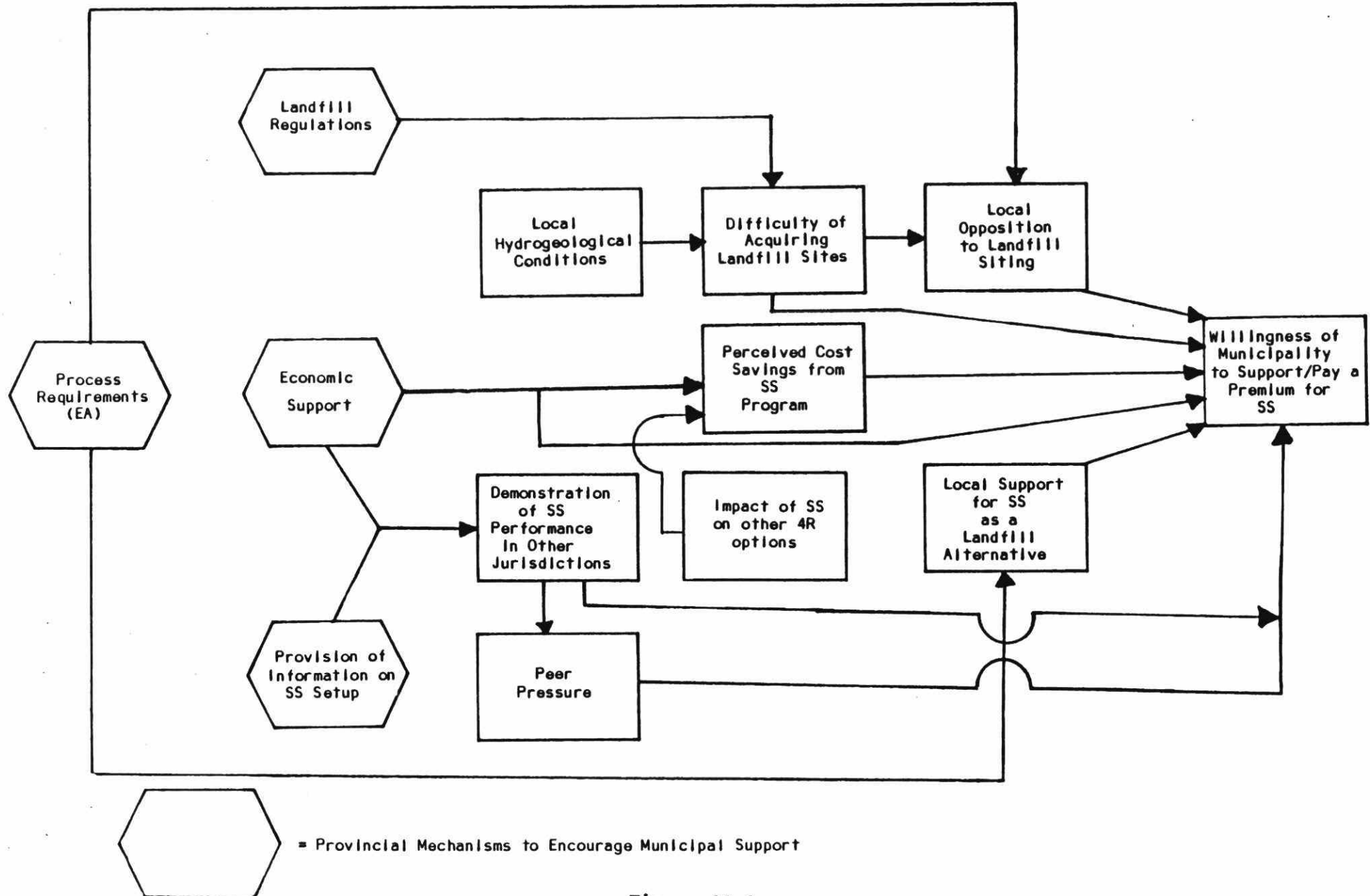
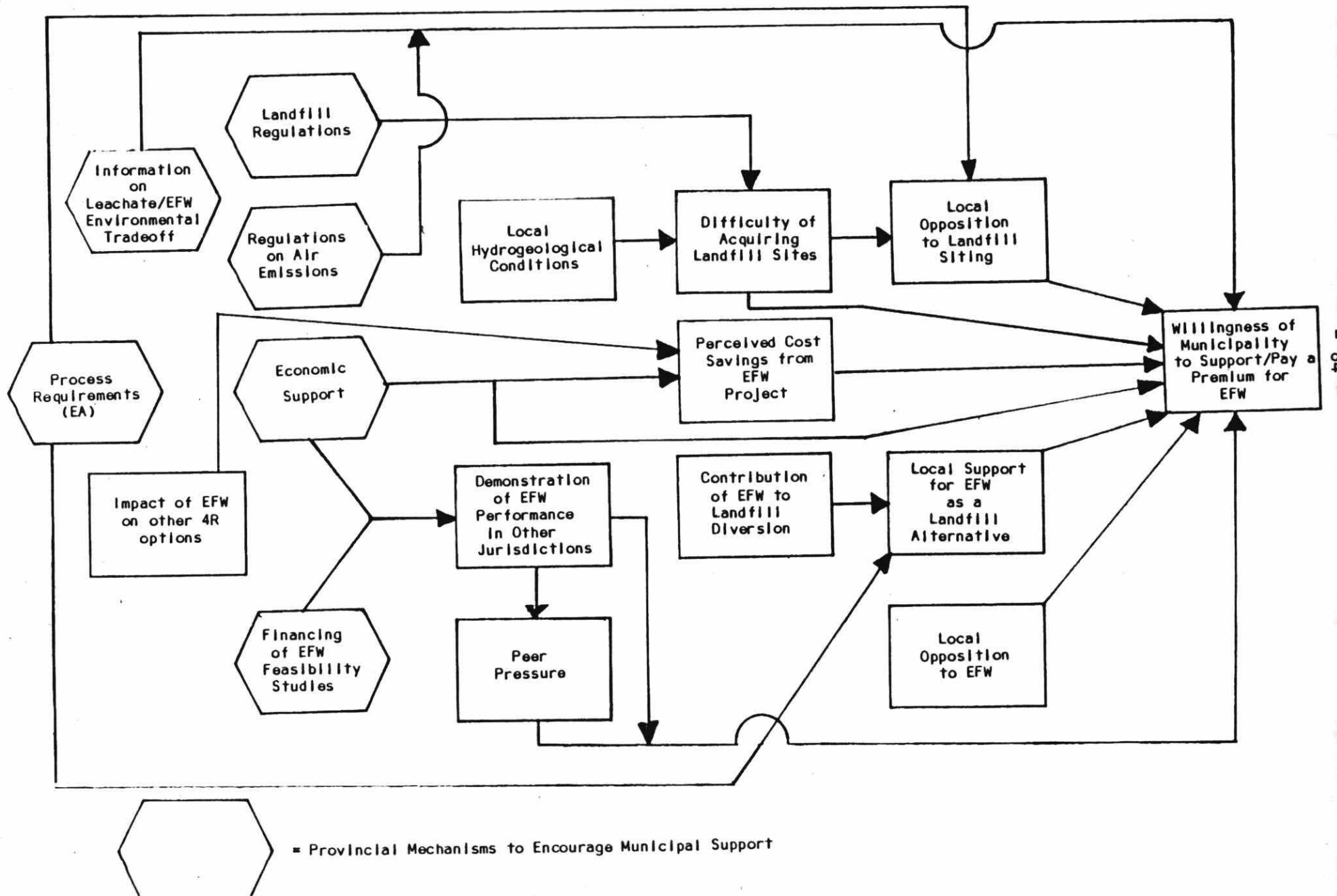


Figure 10.1

Figure 10.2
Municipal Support for EFW
(Landfill Acquisition Phase)



It can also seek to increase the political pressure on municipalities to make decisions in favour of the 4Rs, encouraging them to pay a premium by strengthening those political forces in the municipality's constituency which are applying direct pressure on municipal authorities to implement alternatives to landfill.

Specific Measures

- . Provincial levers: Figure 10.1 and 10.2 indicate the primary levers open to the province to encourage municipalities to support EFW and source separation. They also illustrate the confluence of factors at work during the landfill acquisition phase. It is a critical period for influencing municipal decisions.*
- . Ongoing municipal commitments: The pro-recycling fervour displayed by municipal politicians faced with the need to acquire a new landfill may evaporate over time. Without continuing pressure, or some quasi-legal requirement to continue the program, municipal politicians may be reluctant to continue to pay diversion credits. Waste management companies like Laidlaw who sign long term contracts for recycling manage to lock the commitment in.
- . The dioxin issue and possible provincial action: The dioxin issue is potentially a critical problem because it can have a major impact on the participation of the municipality.** It can derail projects before they get to the approvals stage. The NITEP program and the de facto "best available technology" approach of adopting Victoria Hospital's performance by the industry may handle the problem. However, the Ministry of Environment should consider a public process of examining its provisional guideline to help clear the air and assist in establishing Ministry credibility.***
- . Provide clearer information on the Ministry's regulatory approach: Again and again in public discussion and in the environmental assessment hearings, the Ministry's approach to

* The economic attractiveness of the alternatives can decrease markedly if they are not incorporated into the system during the planning period.

** It can also affect the proponent and the energy user's participation.

*** See Appendix 4.4 for a discussion of the dioxin issue.

regulating emissions from EFW plants (and other stationary sources) is raised. The issues are complex. Because of the complexity of the issues, and in part because of the way in which Ministry officials sometimes explain them, members of the public are mystified and confused by the explanations. Mystification and confusion can easily turn into hostility and feelings of being used; some members of the public feel that if they cannot understand what it is the Ministry is explaining, it is perhaps because the Ministry is trying to "put something over on them".

This could be addressed in two ways:

- the preparation of written material and audio-visual material
- training of Ministry personnel to explain these concepts in public.

Encourage the Use of Effective Consultative Mechanisms

The Environmental Assessment process provides for extensive consultation during the consideration of solid waste management alternatives. The challenge is to provide for a consultation which increases the likelihood of consensus in the community. Much of the consultation we have observed has taken the form of "information meetings". However, it may be necessary to go beyond this approach and involve members of the community directly as advisors in grappling with the trade-offs.

This may be necessary for the developing of a consensus around alternatives to landfill. In Halton, for example, the energy from waste issue was proposed separately and apart from the process of landfill acquisition. While there were considerable efforts made to involve the public, the EFW issue was raised separately and directly from other solid waste management issues, despite the fact that Halton was in the process of acquiring a landfill.

The method used in Waterloo, in which the discussion of the EFW plant took place within the context of a Master Planning process, involving full consideration of all the alternatives, it was primarily that of the information meeting. However, by beginning discussions in the rural areas around the issue of siting the next landfill and by combining this discussion with alternatives to landfill, the discussion was effectively focussed on alternatives. It proved to be a very productive way:

- . to mobilize opposition to landfill in the more rural areas where the landfill is likely to be located

- . to galvanize support of members of the community in urban areas who are in favour of alternatives to landfill.

While the Waterloo approach may be successful in placing concerns about EFW in context, it should be pointed out that there may still be a problem in developing community consensus about including EFW, especially in communities which have a rural population with less influence.

Consultative committees on solid waste management issues have shown themselves to be effective in the U.S. and elsewhere in helping to gain credibility for some of the more unpopular alternatives. The committee is composed of representatives from interest groups and faced with the task of wrestling with the real trade-offs involved. The Ontario government should consider suggesting this kind of committee as "the norm" for EFW and Master Planning.

CHAPTER 11

Strategic Options -- Background Considerations

11.1 Strategic Opportunities and Options

The previous chapters have indicated significant opportunities for the provincial government to encourage the 4Rs in the province. A number of factors contribute to this: the implementation of EA and the fact that a number of municipalities are currently involved in the process, or will be over the short to medium term, the increased cost and difficulty of acquiring landfill, the growing public support for decreased waste, the opportunity for expanding the source separation system across the province and so on.

If the government wishes to expand 4Rs use in the province it should use the following general guides in formulating its strategic option of choice:

1. Utilize the growing public sentiment mobilized by the EA process to provide maximum pressure on municipal authorities to make commitments to and provide ongoing financial and other support for the commitment to the 4Rs.
2. Draw on the full range of tools and measures available to the government to encourage 4Rs implementation. These range from regulatory powers through financial incentives through informal technical and policy advice to municipal officials.
3. Actively pursue the interconnections that exist among and between the Rs and landfill to maximize 4Rs implementation opportunities. For example, source separation programs can be used to encourage reduction; and conditions attached to grants and landfill approvals can be used to encourage or require municipal 4Rs implementation. This should be firmly fixed in the Ministries' consciousness so the Ministries internal division of responsibilities does not result in a "hermetically sealed" approach to 4Rs implementation and the loss of opportunity to build on natural synergies.
4. Base programmatic initiatives on clearly defined medium and longer term priorities for 4Rs implementation.

The last point raises a policy matter: the choices within and between the Rs and the measures available to promote them. While this is beyond the terms of reference for this study, the next section begins the discussion of this issue.

11.2 The Elements of Strategy Formulation

Selecting a strategy involves answering three questions:

1. What are the objectives and priorities for government intervention?

Why intervene? What are the overall purposes which the policy is attempting to achieve? What are the anticipated benefits of government intervention? What criteria of success will be used in assessing policy?

2. What are suitable modes of intervention?

What measures are considered appropriate forms of intervention? Are existing legal and jurisdictional boundaries to be considered as given? Is the use of intervention by the market mechanism to be preferred over legislative initiative?

3. What will work?

What will be effective in increasing the implementation of the 4Rs? What are the interconnections between policy initiatives taken with respect to landfill and the 4Rs; how might a synergy between measures and alternatives be developed?

What forces and factors are influencing the 4Rs; what is likely to make a difference?

The previous chapters have dealt with the final question. They have indicated the factors which influence the implementation of the 4Rs and specify some of the measures open to the government to encourage 4Rs implementation.

As for the first two questions, though these are essentially policy issues, the study team was not guided by the project's steering committee on them. Consequently it has been necessary to examine strategic options rather broadly. The following discussion is meant to help the Ministries sort through some of the policy choices.

11.3 Why Should the Provincial Government be Involved?

For the provincial government, the benefits from encouraging the 4Rs include:

Environmental impacts. Reduction, reuse and recycling save the air and water emissions and leachate associated with transporting and landfilling solid waste.* EFW and mechanical separation save these, but add the air and water impacts associated with operating the plants and incinerating combustibles.

Landfill Savings. Apart from the impacts associated with leachate, all of the 4Rs options reduce the necessity to acquire landfill. In doing so they:

- . add to the diversity of the solid waste management system
- . decrease the insecurity involved with finding suitable landfill

Energy and Materials Savings. Reduction saves energy and materials by not requiring them in the production cycle to begin with and by not consuming materials and energy in the disposal process. Reuse and recycling have similar impacts. EFW substitutes solid waste for fossil fuels.

Economic and Social Impacts. The costs and social disruption associated with the landfilling process are mitigated by all of the Rs. The 4Rs have economic and social impacts of their own. Some are more significant than others. Both source separation and EFW can cost more in economic terms and EFW has had siting problems. Job impacts are also a factor. Some of the Rs, such as source separation appear to offer more jobs, or at least more widely distributed jobs, than other waste reduction and management.

Annex I discusses this issue in more detail, elaborating on how, in the potential implications for provincial policy. The next section discusses how the evaluation of these benefits and their relative ranking can affect strategic choice.

*Reduction also saves the environmental impact associated with producing the good in the first place. Reuse and recycling add the environmental impacts associated with collection, cleaning, etc.

11.4 Two Evaluation Approaches

Two overall strategic approaches are described below. Each is distinguished primarily by its answer to question #1: based on an assessment of the benefits, what are the objectives and priorities for government intervention?

Option 1: Environmental Hierarchy

The first approach is founded on the view that the Rs should be supported purely on the basis that, and the extent to which, they are advantageous environmentally. The degree of effort and support should be determined in the first instance by what the Rs can do environmentally. Questions of economic costs of implementation, and likely effectiveness of that implementation are considered as secondary concerns.

This approach places top priority on reduction, reuse and recycling, in that order. When formulating priorities on this basis the government should:

- . encourage an R only if it is certain that it is environmentally superior to the R or other solid waste management technique (e.g., landfill) which it would be replacing.
- . determine how the encouragement of any R can reasonably be used in the short, and longer run to help with the implementation of the R higher up in the hierarchy.
- . constantly seek reasonable ways to move the province over the medium and long term to incorporate more of the higher Rs in the hierarchy.

The key issue is: what belongs and what does not belong in the hierarchy? The dividing line at this point appears to be centralized material and energy recovery of waste. Some of those advocating the hierarchical approach would exclude these latter technologies, preferring landfill to EFW and resource recovery technologies pending further information on their environmental performance. Others would include these technologies "last on the list" of the R's and place priority on ensuring that their implementation did not jeopardize Rs further up on the hierarchy.

In the current context, implementing this approach would mean placing a heavy emphasis on extending the recycling network across the province, and adopting the range of measures suggested in the sections on reduction and recovery. It would also entail a continued strengthening of landfill regulations and perhaps the implementation of a landfill surcharge. If the Ministry adopted this overall approach, it would need to make an explicit choice about the environmental acceptability

of EFW compared to landfill. If EFW is environmentally preferable, then the efforts of the Ministry should reflect its relative priority on the scale. As the discussion in Annex 1 indicates, this is a particularly important issue, given the apparent lack of information on the comparative environmental effects of leachate and EFW emissions.

If EFW is considered acceptable then this approach becomes "minimize landfill", with priority given to the ranking in the hierarchy.

This approach lends itself to the formulation of 4Rs implementation targets for the province, based essentially on technical potential modified by economic "realism".

Option 2: Overall "Cost-Benefit"

This approach would use a benefit cost framework to help to set priorities and establish concrete implementation plans. This approach takes environmental impacts into account, but attempts to quantify them so that they can be included along with other impacts (economic, social, etc.) in the evaluation of the alternatives and the assessment of the appropriate mix of options. It is generally consistent with the use of a combination of market forces and government interventions to rectify imbalances and barriers.

There are a number of different versions of this approach. In the current context the priorities for the Ministries depend upon their evaluation of the respective energy, social and environmental benefits. One approach attempts to match barriers with countervailing government initiatives and lets the waste management system "decide" on the basis of the regulatory and price signals which result. The Annexes and Appendix 6 explore variants of this approach in depth.

Overall Strategic Options

The previous chapters have described in depth the choices open to promote the different Rs. This section indicates what overall prioritization between the Rs different strategies might choose to emphasize. In addition a range of detailed choices for source separation and EFW which was developed for the interim report is included as Annex 3. It can serve as an indication of the range of variation appropriate for each.

The two major choices appear to be:

1. Emphasize the 3Rs. Encourage only reduction, reuse and recycling. Until the technical and environmental performance conditions for EFW and RDF from resource recovery facilities can be better determined through research, rigorously enforced landfill should be preferred. Use every opportunity to further the 3R hierarchy.

Place emphasis on developing a province-wide recycling system, using it as a primary vehicle to develop environmental consciousness and to encourage reduction and reuse. Undertake an intensive education campaign to promote the 3Rs.

2. Encourage all of the Rs. The relative weight placed on each should be determined by specific circumstances. Encourage the source separation network. If financial incentives for EFW and resource recovery are chosen, they should be based on one of the following: cost sharing with the municipalities, a percentage capital grant, or the equivalent of a tonnage grant based on an evaluation of the energy and environmental value to the province of a tonne of solid waste diverted from landfill.

11.5 Selecting Financial Incentives for Encouraging the 4Rs

Because of the variability in EFW and source separation economics, it is not possible to estimate program costs and take-up. The analytical framework developed permits the investigation of a number of different possible approaches for choosing a grant approach. The following kinds of approaches are some of those possible:

1. Capital Cost Percentage. This approach was used by FIRE in setting the maximum grant for EFW permitted. It has the merit of eliminating controversy and protracted negotiations. It is appropriate to use in situations where there is a clear idea of what the technology is worth to the government. It would be a particularly appropriate approach for setting EFW or source separation grants, if a value could be placed on each tonne of EFW or source separation capacity. In other words: select the dollar value that a tonne of waste used in EFW is worth - e.g., X\$ for energy savings plus \$Y for landfill environmental and social impact savings - and then relate this directly to the tonnage capacity of the EFW or source separation. The advantage is that projects would be undertaken which are merited given the value placed on them (if the value could be determined). The disadvantage for a government concerned about program take up is that it is possible that no projects will be economically attractive even with the capital cost grant.

The other merit to this approach is its clarity to prospective proponents. They are aware of what is available and can make their calculations and decisions accordingly.

2. Cost Sharing. The idea behind cost sharing is to have the province and the municipality split the incentive paid to the project proponent in some agreed-upon fashion. The advantages to this approach are that there is a shared cost and there is a direct incentive for the municipality to become actively involved in the solid waste management project. It can also in effect guarantee

enough grant to allow the project to go ahead, given municipal willingness to pay half the required price. The disadvantages are two-fold. The formula that is eventually arrived at may be cumbersome and/or inequitable. Also it may provide a disincentive for one of the parties to agree to pay as much as they would have in the absence of the agreement.

For example, if it is agreed that the province and the municipality will share the costs of subsidizing an EFW facility by each putting in one-half of the difference between the tipping fee and the municipality's avoided cost, then the municipality may end up paying much less than it would otherwise. For example, as mentioned throughout the report, there is increased evidence that some municipalities are willing to pay a (significant) premium over avoided cost in order to save landfill. With a grant formula based on sharing the cost premium, the municipalities have every incentive to sharpen their pencils and take a very narrow avoided cost approach.

This problem could be avoided in part by specifying that average disposal cost, rather than avoided disposal cost would be used to set the base number upon which the cost sharing would be calculated. This would increase the municipal contribution. It also has the added virtue of computational simplicity.

3. Case by Case Evaluation. This approach can be based on a specified target rate of return which is considered to be appropriate, or nothing more specific than the determination to have projects implemented. It can also be based on funding program losses. Its virtue is program take-up. Its weakness lies in the frequently undefined nature of the criteria, the susceptibility of the process to bargaining pressure and falsification of information, the potential for grossly unequal treatment of projects, and the lack of incentive for project performance efficiency (in the case of funding losses).

ANNEX 1

THE POSITIVE IMPACTS OF EFW AND SOURCE SEPARATION

ANNEX 1

The Positive Impacts of EFW and Source Separation

EFW projects reclaim energy from an indigenous Ontario resource and save the social and environmental impacts associated with the solid waste which they divert from landfill.* Source separation projects reclaim resources for recycling, save the social and environmental impacts associated with the waste they divert from landfill and involve Ontario householders and commercial/industrial operators in an activity which can promote other conserving behaviours. Reuse has the same kind of effect as recycling, without remanufacturing materials. Reduction, of course, is a pure saving activity -- all of the landfill effects are avoided and none of the production related effects incurred.

Do these impacts constitute the net benefits to the province of encouraging these technologies? There are three considerations which are central to this evaluation:

- . Many of the net impacts are highly site specific. The social impact savings of not landfilling waste differs markedly from site to site, depending on population proximity. The same is true for environmental impacts and economics.
- . The existing processes for deciding whether or not these projects should go ahead already factor in these considerations, more or less imperfectly.
- . Information on the nature of these impacts - eg. leachate impacts of diverting certain portions of the waste stream from landfill - is frequently imprecise or non-existent.

Thus it is difficult to identify the benefits to the province without closely examining the nature and weaknesses of the existing decision-making processes which determine whether or not the 4R process is implemented. The following can be concluded however:

Energy Benefits

EFW and RDF save fossil fuels. Resource recovery and source separation can save fossil fuels too, depending on the uses to which the recovered

* They also have air and water emissions and leachate impacts associated with the landfilled ash.

materials are put.* The benefit to the province is the quantity of fossil fuel energy saved times the energy security premium which is not reflected in the market price of fossil fuel. Reduction can save energy too.

Environmental Benefits

EFW saves the air emissions and leachate associated with transporting and landfilling the diverted portion of the waste stream. It adds the leachate associated with landfill-disposed ash, as well as the air and water emissions from plant operation and waste and ash transportation. Source separation saves the air emissions and leachate associated with transporting the diverted portion to landfill and adds the emissions associated with source separated materials transportation and processing. Reduction saves all of the landfill-related environmental impacts.

Are these a net plus or a net minus to the province? There are two difficulties associated with assessing this. The first is the already-mentioned site specificity of impact and imprecision of information.

The second is the manner in which the province administers environmental regulation. This is particularly important concern for adducing a provincial environmental benefit premium to landfill alternatives. The Ministry of the Environment sets environmental standards for landfills and EFW plants (and implicitly source separation programs). It uses a "no effect" criterion in establishing these standards and guidelines. On the basis of this approach any approved landfill or EFW facility approved is considered to be environmentally acceptable. Thus attributing an environmental premium to any of the alternatives appears to involve a basic contradiction in the Ministry's stance.**

Materials Savings Benefits

Reclaimed materials may be underpriced because of special subsidies to virgin materials or market imperfections. The benefit to the province

* See Middleton Associates, Net Energy Savings From Solid Waste Management Options. The estimated quantity of fossil fuel energy saved by EFW has been incorporated in the computerized evaluation framework created to assess the options. The value of the energy security premium is a user specified variable. See Appendix 7 for a brief description of the model and Appendix 4 for some indicative results of the implicit energy security premium involved in different levels of support for EFW.

** See Appendix 6 for a more detailed discussion of this point.

is the difference between the market price and the true value of the material.*

Saved Economic and Social Impacts of Landfill

These are highly situation specific. The EA process should help to ensure that these impacts are accounted for relatively accurately. Encouragement of better accounting systems and of compensation for affected individuals is also possible. In the absence of these changes, it is difficult to make a blanket provincial incentive to incorporate this impact adequately and equitably.**

Jobs and Economic Activity

The computerized evaluation framework allows the calculation of total jobs and economic activity associated with the implementation of source separation and EFW program alternatives. Can these be considered benefits of the program?

First, in comparing any two activities, the one costing more will almost inevitably create more jobs. In the case of the 4Rs, reduction by using less will always create fewer jobs -- should this be considered a negative factor for reduction? Secondly, if two activities cost the same, the differences in jobs created often boils down to different wage rates -- more jobs because of lower pay per job.***

Any government expenditure will create economic activity and employment. One question is: will it create net jobs compared with the alternative program? Normally government initiatives with the potential to create a self-sustaining industry come out best on this account. A second question is: how accurate are the estimates produced? The economic tools available produce very crude estimates of indirect and induced effects. Finally, what are the nature of the job differences

*. The evaluation framework provides for a user specified materials premium.

**. Appendix 6 section 9 discusses an approach to dealing with these impacts in a detailed fashion, comparing the approach of attempting to make process changes to better incorporate the effects with the approach of using an EFW or source separation economic incentive or other credit.

***It is necessary to look not just at direct impacts, but indirect and induced ones as well, when calculating job effects. Often one option looks much more labour-intensive at the direct stage, but ends up having about the same total employment impact when the indirect and induced effects are accounted for.

identified -- Are they due to lower wage levels? Are the jobs more evenly distributed across the province than the alternatives?

It may be more appropriate to attempt to capture the beneficial effect of job creation by assessing the project using the benefit-cost approach in the computerized evaluation framework, but valuing the labour component cost at less than the prevailing wage rate.*

Another job-related effect relates to source separation's potential to employ the handicapped. In assessing this as a benefit it is important to note that its value may already be captured, in part at least, by the training and related subsidies paid to the program by other government agencies. Only that social value of employing the handicapped not captured by this subsidy should be included.

Impact on Environmental Attitudes

Involving the householder in source separation can increase environmental attitudes and conserver behaviour in other spheres.** Clearly it appears to be one of the positive spin-offs of source separation programs, but it is very difficult to quantify.

*See Appendix 6 section 5 for a more detailed discussion of this.

**Energy conserving behaviour or other waste reducing activities can be encouraged. In Kitchener, there was a dramatic increase in the response to a home composting program after local citizens had been involved in the source separation program.

ANNEX 2

THE ROLE OF LANDFILL REQUIREMENTS AND THEIR IMPLICATIONS FOR 4RS

ANNEX 2

THE ROLE OF LANDFILL REQUIREMENTS AND THEIR IMPLICATIONS

FOR 4Rs

Even a significant increase in 4Rs activity will leave waste requiring disposal. Thus, landfill is likely to remain a central part of solid waste management systems in Ontario.

Landfill policy is inextricably intertwined with 4R strategy. A move to more environmentally stringent landfill could greatly assist the alternatives if done as part of a commitment to increasing the 4Rs.

It would include some combination of measures as:

- . Tighter environmental regulations on landfill
- . The implementation of a perpetual care program
- . The use of the EAB to require full costing of landfill and a full credit to alternatives.
- . The strengthening of compensation measures for those affected in areas neighbouring landfill
- . The levying of a landfill surcharge
- . The narrowing of the jurisdiction for disposal responsibility (to encourage the implementation of landfill alternatives within local areas unable to locate a landfill)
- . The discouragement of crossing municipal boundaries for waste disposal
- . The discouragement of export of waste to U.S

The 4Rs would be further promoted by discouraging landfill. The more radical measures such as jurisdictional narrowing and discouraging of boundary crossings would have the greatest impact.

Another strategic variant emphasizing the importance of improving landfill quality would have a quite different effect on resource recovery and EFW and perhaps on source separation as well. It would emphasize good landfill as the centrepiece to future solid waste management in Ontario. Proponents of this view might argue that solid waste management problems can be best addressed by encouraging state-of-the-art landfill performance. The argument would run that better landfill is the most cost-effective approach

to the solid waste management problem and to landfill crises, where they exist. In this view the strategy would involve

- . More stringent landfill requirements
- . Strong encouragement to develop large sites serving several jurisdictions, located in hydrogeologically acceptable areas, highly engineered as appropriate.

To the extent that the higher capital costs and haul requirements increase disposal costs this would encourage the 4Rs. However, if subsidizing mechanisms are set up to encourage this approach (eg. transport subsidies) the alternatives would suffer. They would be discouraged under this scheme in any case if the large landfill could be located where its capital and operating cost advantages outweigh the transportation advantages of resource recovery, EFW and source separation.*

* If the resource recovery or EFW plant could be located closer to the solid waste generation centroid.

ANNEX 3

PRELIMINARY OPTIONS: IDENTIFICATION FOR EFW AND SOURCE SEPARATION

ANNEX 3

Preliminary Options: Identification for EFW and Source Separation

A range of options for energy from waste and source separation is identified below. They were set out for the interim report and to give an example of the range and the factors included. They are not integrated with an overview of a 4R role for the Ministry. Four have been selected for each of source separation and EFW. The computerized analytical tools developed for this project can be utilized to draw out the implications of those alternatives selected for more detailed evaluation.

They do not cover the full range of options possible -- for example, some elements of one could be mixed with others to form different variants. It should be pointed out that the retrenchment option is not really relevant for the short term since the Ministry of the Environment appears to have decided to opt for an enhanced source separation program.

Source Separation Options

Option 1	Retrenchment
Option 2	Moderate Encouragement of Self-Sustainable Source Separation
Option 3	Moderate Encouragement with Continuing Provincial Incentives
Option 4	Major Encouragement

EFW Options

Option 1	Retrenchment
Option 2	Moderate Encouragement on a "Case-by-Case" Basis in Short Term; Leave Longer Term Option Open
Option 3	Encouragement -- General
Option 4	Active Encouragement Targeted on Specific Solid Waste Management Problem Areas

Source Separation Strategic Option 1:

RETRENCHMENT

Theme/Strategic Thrust	<p>Use the existing solid waste processes and traditional government role to guide activity in the source separation area.</p> <p>Source separation to exist only where market forces, local landfill constraints and local support for source separation is sufficient to sustain them.</p>
Possible Rationale(s)	<p>Solid waste management decisions should be made locally based purely on prevailing market conditions, provincial landfill regulations, provincial regulatory processes and local political pressure.</p> <p>The benefits from source separation accrue mostly locally and have few distinct provincial elements which merit special ongoing support.</p> <p>The province's role should be to regulate solid waste management and to remedy information deficiencies where they are obvious and ensure the solid waste management process is equitable.</p>
Information Activities	<p>Provide information on new techniques, methods and approaches only. Perhaps provide some support for conferences, exchanging information on source separation experiences across the province.</p>
Technology Demonstration Activities	<p>Support only technology demonstrations which are not done elsewhere and those which have obvious potential benefit for Ontario. Target primarily problematic wastestream constituents.</p>
Market Development Activities	<p>Attempt to remedy obvious inequities in secondary materials markets which the provincial government has the levers to address. Watch briefly. Provide some information on market activity. Provide selective support for new product developments using recycled materials.</p>

Source Separation Strategic Option 1:

RETRENCHMENT

(Continued)

Commercialization Support
for Source Separation

None. Allow existing program to lapse.

Ongoing Economic Support

None.

Vehicles for Ongoing
Funding

Not applicable.

Likely Outcome

Only multi-material programs with significant existing municipal support are likely to survive. Future expansion will depend purely on market forces, local landfill requirements, the Environmental Assessment process and local political pressure. Single material programs are likely to come and go with market conditions.

Source Separation Strategic Option 2:

MODERATE ENCOURAGEMENT OF SELF-SUSTAINABLE SOURCE SEPARATION

Theme/Strategic Thrust	<p>Encourage extension of source separation programs but as market conditions and local support permits.</p> <p>Use public support, economic start-up incentives, existing process and market development to assist in extending programs.</p>
Possible Rationale(s)	<p>There are source separation benefits which are of special interest to the province, but which are not adequately reflected in current decision making. These are not purely captured by the cost of landfill, even when landfill is fully costed.</p> <p>Start-up inertia is a major problem, which if overcome can lead to a sustainable program for selected municipalities. To fully leverage local pressure on municipal government, a well-run start-up program must be in place.</p>
Information Activities	<p>Support conferences, newsletters, etc., exchanging information on source separation experiences across the province. Continue to supply information on program start-up. Emphasize distribution of information on new effectiveness-promoting techniques.</p>
Technology Demonstration Activities	<p>Provide a moderately aggressive technology support program targeted on developments which have a good chance of success.</p> <p>Fund innovative programs which target problematic wastestream components but which also offer significant improvement in collection economics for the traditional wastestream components.</p>
Market Development Activities	<p>Provide government support for market development. Focus on a facilitative and communicative role among market players, using moral suasion where possible. Put additional attention on such traditional activity as government purchasing programs, redressing inequities in the primary materials market and developing new uses for recycled products.</p>

Source Separation Strategic Option 2:

MODERATE ENCOURAGEMENT OF SELF-SUSTAINABLE SOURCE SEPARATION

(Continued)

Market Development
Activities
(Continued)

Perhaps provide a contingency plan to help sustain source separation programs during market downturns (a strategy for involving municipalities and major market players in a "fall back" option may be appropriate).

"Seed" Economic Support

Provide incentives for start-up period only.

Criteria and Provincial
Coverage

Incentives should have the objective of directly involving the municipality so that the program shortfall will be taken on locally.

Incentives should also encourage development of program efficiencies. It could be a tonnage-based fee geared to municipal willingness to pay with a sliding-scale phaseout period. Or it could be a one-time only capital-based contribution.

Total amount devoted to the program could be set according to a variety of criteria -- eg, an estimate of the total benefits of the program to the province or set annually on a first-come first-served basis depending upon the province's perception of the ability of the secondary materials market to withstand program additions.

Ongoing Economic Support

None.

Vehicles for Ongoing
Funding

Not applicable.

Likely Impact

This approach will help leverage source separation in municipalities who are in the process of acquiring landfill and/or who have landfill problems. It could also, through a demonstration effect, involve other municipalities who are pressured by constituents. The uptake may be fast or slow depending upon market conditions and the bandwagon effect of the current program.

Source Separation Strategic Option 3:

MODERATE ENCOURAGEMENT WITH CONTINUING PROVINCIAL INCENTIVES

Theme/Strategic Thrust	<p>Encourage extension of source separation programs as market conditions and local support permit, with continuing provincial economic support.</p> <p>Use forces of public support, existing process and provincial market development initiatives to assist.</p>
Possible Rationale(s)	<p>There are source separation benefits which are of special interest to the province, but which are not adequately reflected in current decision making.</p> <p>These are not purely captured by the cost of landfill, even when landfill is fully costed. Continuing provincial support is warranted by the magnitude of the benefits. Political support is widespread across the province.</p>
Information Activities	<p>Support conferences, newsletters, etc. exchanging information on source separation experiences across the province. Continue to supply information on program start-up. Emphasize distribution of information on new effectiveness-promoting techniques.</p>
Technology Demonstration Activities	<p>Provide a moderately aggressive technology support program targeted on developments which have a moderately good chance of success.</p> <p>Fund innovative programs which target problematic wastestream components but which also offer significant improvement in collection economics for the traditional wastestream components.</p>
Market Development Activities	<p>Put in place significant market development program. Play an active facilitative and communicative role among market players, using moral suasion where possible.</p>

Source Separation Strategic Option 3:

MODERATE ENCOURAGEMENT WITH CONTINUING PROVINCIAL INCENTIVES

(Continued)

Market Development
Activities
(Continued)

Place special attention on such traditional activity as government purchasing programs, redressing inequities in the primary materials market, developing new uses for recycled products.

Perhaps provide a contingency plan to help sustain source separation programs during market downturns (a strategy for involving municipalities and major market players in a "fall back" option may be appropriate).

Ongoing Economic Support

Provide ongoing incentives to program. Total amount devoted to the program could be set according to a variety of criteria -- eg, an estimate of the total benefits of the program to the province or set annually on a first-come first-served basis depending upon the province's perception of the ability of the secondary materials market to withstand program additions.

It could also be linked directly to municipality's willingness to pay a premium for source separation.*

Vehicles for Ongoing
Funding

Incentives should have the objective of directly involving the municipality so that some of the program shortfall will be taken on locally. Incentives should also encourage development of program efficiencies. It could be a tonnage-based fee geared to municipal willingness to pay.

*The premium would be calculated as the difference between the municipality's least cost alternative (e.g., a landfill only system) and the source separation option.

Source Separation Strategic Option 3:

MODERATE ENCOURAGEMENT WITH CONTINUING PROVINCIAL INCENTIVES

(Continued)

Vehicles for Ongoing
Funding
(Continued)

Perhaps set up a fund which municipality could draw on to administer as required: either on a tonnage basis, or as "renewable" capital grant. The funding could be done via:

- a provincial landfill levy
- a fund financed through general revenue.

Likely Impact

This approach will help leverage source separation in municipalities who are in the process of acquiring landfill or who have landfill problems.

It could also, through a demonstration effect, involve other municipalities who are pressured by constituents. The uptake may be fast or slow depending upon market conditions and the bandwagon effect of the current program.

It will decrease the number of programs which go under after an initial start-up period and will encourage municipalities who are reluctant to pay out the amount required for full backup.

Source Separation Strategic Option 4:

MAJOR ENCOURAGEMENT

Theme/Strategic Thrust

Encourage accelerated widespread extension of source separation across the province. Use a combination of a major influx of funds (public and/or private) to provide driving force. One version of this strategy has container legislation playing the central role -- the introduction of aluminum and plastic provides the incentive for private involvement and the economic underpinnings for a sustainable system.

An alternative strategic thrust is to mandate source separation programs for municipalities in Ontario.

Possible Rationale(s)

The province should have a stringent source separation target to meet. There are major benefits to the province not reflected in current decision making.

Source separation should be practiced as widely as possible because of these benefits despite the subsidy that may be required beyond what many municipalities are willing to pay.

Container regulations provide a unique opportunity to extend source separation across the province.

Political support exists for source separation across the province.

Information Activities

Provide major training programs for new source separation operations. Also support conferences, newsletters, etc. exchanging information on source separation experiences across the province. Continue to supply information on program start-up. Emphasize distribution of information on new effectiveness-promoting techniques.

Source Separation Strategic Option 4:

MAJOR ENCOURAGEMENT

(Continued)

Technology Demonstration
Activities

Provide an aggressive technology support program targeted on developments which have a moderately good chance of success. Fund innovative programs which target problematic wastestream components but which also offer significant improvement in collection economics for the traditional wastestream components.

Market Development

This must be a major government support activity. Focus on a facilitative and communicative role among market players; place heavy emphasis on moral suasion. Emphasize government purchasing programs, redressing inequities in the primary materials market, developing new uses for recycled products.

An alternative or supplement is to obtain guarantees from major purchasers on basis of container-related commitments.

Actively investigate contingency plan for market downturn.

"Seed" Economic Support

Provide widespread support, not necessarily linked to willingness of municipality to pick up diversion credit for shortfall.

Criteria and Provincial
Coverage

Provincial coverage could be province-wide or more restricted depending upon the phasing-in plan and the role of the changes in container legislation.

If the province decides to mandate source separation, it could either ignore the financing requirement, leaving it on the municipality's shoulders or provide a source separation fund from which the municipalities could draw.

Source Separation Strategic Option 4:

MAJOR ENCOURAGEMENT

(Continued)

Ongoing Economic Support

The magnitude of the ongoing economic support depends on the effectiveness of marketing activities, the nature of the materials handled by the system, and the geographic spread of the system. In order to sustain the system, however, it will be necessary to provide funds on the basis of some formula. One approach would be to provide up-front capital grants, renewable as the capital equipment required replacement. Another possibility is to provide an ongoing tonnage-based grant.

Vehicles for Ongoing
Funding

Depending on the manner in which the program strategy was implemented, the vehicle could be:

- . A combination of private and public sector up-front grant
- . A provincial fund financed through a landfill levy
- . A provincial fund financed through general tax revenues (presumably Ministry of the Environment's budget)
- . A separately funded institution, such as a Crown Corporation administering the grant.

Likely Impact

Major additional quantities of recyclable materials would be recovered. Whether these materials would be actually recycled depends on market conditions and market development. So too does the cost of sustaining the system over time.

EFW Strategic Option 1:

RETRENCHMENT

Theme/Strategic Thrust	Energy from waste plants should be implemented only where current economics, available federal incentives and local support for landfill alternatives are sufficient to sustain them.
Possible Rationale(s)	<p>Solid waste management decisions should be made locally, based purely on prevailing energy marketing conditions, provincial landfill regulations, provincial regulatory processes.</p> <p>The solid waste management related EFW benefits accrue mainly to the local community. The special energy benefits relating to the use of an Ontario energy source are adequately rewarded by the Class 34 write-off.</p> <p>The province's role should be to regulate, remedy information deficiencies and ensure that the process treats EFW equitably.</p> <p>There is no clear consensus in Ontario that EFW is an environmentally-superior technology.</p> <p>The technology has already been adequately demonstrated in other jurisdictions.</p>
Information Activities	Provide information on new techniques, methods and approaches only. Perhaps support funding of feasibility studies. Perhaps assist process of clarifying dioxin issue.
Technology Demonstration Activities	Support only EFW technologies which have not been demonstrated elsewhere and have a real prospect for significant commercialization in Ontario.
Market Development Activities	Provide market activity through funding of feasibility studies and conferences on energy from waste activities.
Commercialization Support for EFW	None. Allow existing "case-by-case" program to lapse.

EFW Strategic Option 1:

RETRENCHMENT

(Continued)

Criteria and Provincial
Coverage

Not applicable.

Ongoing Economic Support

None.

Vehicles for Ongoing
Support

Not applicable.

Likely Impact

Only those MSW EFW plants with existing FIRE grants (Peel) have reasonable chance of success. Future MSW plants will depend upon a very good energy fit and a willingness of the municipality to pay a tipping fee premium. Selected industrial applications could provide an ongoing market.

EFW Strategic Option 2:

**MODERATE ENCOURAGEMENT ON A "CASE-BY-CASE" BASIS IN SHORT TERM;
LEAVE LONGER TERM OPTION OPEN**

Theme/Strategic Thrust	<p>Provide financing to those plants having good prospects of success in short term, primarily to avoid losing the leverage of the FIRE grant program for those projects which have already received commitments.</p> <p>However, make no longer term commitment to EFW pending a "sorting through" of the environmental issues relating to the technology in Ontario.</p>
Possible Rationale(s)	<p>EFW provides important energy benefits to the province. It also is the technology with the greatest solid waste diversion potential. These benefits are not reflected in current decision making adequately.</p> <p>The technology is environmentally sound and so should be supported in the short term, but municipal and public confidence in the dioxin performance of the technology should be deepened before any longer term commitments are made.</p>
Information Activities	<p>Provide information on new techniques, methods and approaches only.</p> <p>Begin process of dealing with the dioxin issue publicly -- through NITEP result publication and/or additional Ontario initiatives.*</p>
Market Development Activities	<p>Short term holding pattern pending longer term decision. Funding selected feasibility studies and conferences on energy from waste activities.</p>
Ongoing Economic Support	<p>Provide capital grant on case-by-case basis using criteria such as a reasonable return to the proponent and the perceived value of the project to the province. Perhaps base grant on evaluation of energy benefits.</p>

*See discussion on Dioxins: Strategic Alternatives in Appendix 4, Section 4.

EFW Strategic Option 2:

MODERATE ENCOURAGEMENT ON A "CASE-BY-CASE" BASIS IN SHORT TERM;
LEAVE LONGER TERM OPTION OPEN

(Continued)

Vehicles for Ongoing
Funding

Capital grants, provincial sales tax relief,
operating grants, pollution control
monitoring support.

Likely Impact

Gives high chance of success to projects with
FIRE grant. Other projects' success depend
on magnitude of grant made available.

EFW Strategic Option 3:

ENCOURAGE OF EFW -- GENERAL

Theme/Strategic Thrust	Encourage EFW plant development as conditions of economic fit, energy value and diversion credit value, dictate. Provide program of economic support on the basis of stated criteria.
Possible Rationale(s)	<p>EFW has energy, environmental and related benefits which are not reflected in local decision-making process, even with full costing of landfill.</p> <p>The province should provide an incentive which reflects this benefit based on the perceived energy and environmental value.</p>
Information Activities	Continue supply of information on EFW technology promotion. Provide environmental information support on leachate/emissions tradeoffs.
Technology Demonstration Activities	Support demonstration of new technologies with reasonable chances of success.
Market Development Activities	<p>Support feasibility studies. Make the provincial government and its institutions a priority market by adopting a government policy to provide full energy value to EFW facilities.</p> <p>Encourage Ontario Hydro to play an active role as energy customer in these projects, perhaps giving these projects a special priority.</p> <p>Encourage proponents and projects to cost minimize -- eg, public sector.</p>
Ongoing Economic Support	Could be based on an energy value "plus" a cost-sharing agreement with the municipality -- eg, equivalent to the amount the municipality is willing to pay over and above its avoided cost of landfill. Or could base grant on evaluation of energy and environmental benefits.

ENCOURAGE OF EFW -- GENERAL

(Continued)

Ongoing Economic Support
(Continued)

It may be necessary to set up different criteria for different kinds of plants. The economic advantage that dedicated industrial users have should be taken into account.

Vehicles for Funding

If based on evaluation of energy and environmental benefits could be:

- . Percentage-based capital grant
- . Tax-based support to replace/supplement Class 34
- . Could use Crown Corporation with equity participation

Likely Impact

Depends fundamentally on the level of grant decided upon. It could have a major positive impact on encouraging those projects which have already been developed but which did not receive a commitment from the FIRE program; as well as those projects which have received FIRE commitments.

EFW Strategic Option 4:

**ACTIVE ENCOURAGEMENT OF EFW TARGETED
ON SPECIFIC SOLID WASTE MANAGEMENT PROBLEM AREAS**

Theme/Strategic Thrust	<p>Encourage EFW plant development but related specifically to particular solid waste management needs, on a case-by-case basis.</p> <p>Perhaps emphasize EFW as a solid waste management technique which can be used to solve solid waste problems of several jurisdictions.</p>
Possible Rationale(s)	<p>EFW has an important role to play as a diversion technology for municipalities with acute landfill problems. As these problems emerge, and deepen, municipalities may be unable to ensure EFW implementation because of project complexity or financial requirements. The province could play an essential role in enabling these projects to go ahead on a case-by-case basis.</p>
Information Activities	<p>Continue information on EFW technology promotion. Provide major encouragement to municipalities with landfill problems.</p>
Technology Demonstration Activities	<p>Support demonstration of technologies with reasonable chances of success.</p>
Market Development Activities	<p>Support feasibility studies in those areas with major solid waste problems. Make the provincial government and its institutions in these areas a priority market by adopting a government policy to provide full energy value to EFW facilities. Encourage Ontario Hydro to play an active role as energy customer in these projects, (perhaps a preferential rate).</p>
Special Provincial Role	<p>The province could act as project facilitator/director. In order to cost minimize, it could encourage specific kinds of energy markets and energy users (see the sensitivity analyses in Appendix 4).</p>

EFW Strategic Option 4:

ACTIVE ENCOURAGEMENT OF EFW TARGETED
ON SPECIFIC SOLID WASTE MANAGEMENT PROBLEM AREAS

(Continued)

Economic Support

Provide economic support on fixed formulae basis -- eg, cost share with municipality, perhaps half of the tipping fee premium the municipality is willing to pay.

Provide support on an as required basis to encourage implementation.

Vehicles for Funding

Special fund for "special problem" waste management jurisdictions.

Special Crown Corporation to act as project facilitator/director and provide equity participation.

Capital grants, loans, tax breaks as needed on ad hoc basis.

Cost sharing formulae administered by province as indicated above.

Likely Impacts

Solution could prove useful for municipalities such as Halton with critical waste management problems but who have had trouble putting projects together. Tempo will depend upon nature of funding formulae and progress of "problem" municipalities through EA.



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THE 4Rs IN ONTARIO

AN EXAMINATION OF SELECTED OPTIONS

APPENDICES

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January, 1986

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APPENDIX 1

LANDFILL COSTS AND AVOIDED COSTS FROM EFW AND SOURCE SEPARATION

APPENDIX 1

LANDFILL COSTS AND AVOIDED COSTS FROM EFW AND SOURCE SEPARATION

1.0 Introduction

Landfill cost savings are important for the overall evaluation of 4Rs benefits and for the motivation of municipalities to proceed with the 4Rs.

There are two important cost concepts which are often confused: landfill costs and landfill cost savings which result from the implementation of alternatives to landfill. Representative costs of landfill are developed in section 2; to the extent that data availability has permitted, these are representative of recently approved sites. These are likely to be a more accurate guide to present and future costs than those approved under previous, less stringent standards. Section 3 outlines an approach to calculating cost savings associated with alternatives to landfill.

2.0 Costs of Landfill

A. The Current Regulatory Environment

Landfill technology appropriate for use in Ontario is determined by regulations governing landfill implementation. In Ontario, landfill approvals are made under the Environmental Protection Act. Section 30 of the Act requires a hearing for:

- . all new landfills to serve populations greater than 1,500
- . all expanded landfills to serve populations greater than 1,500.

If the landfill proponent is a municipality, then Section 30 automatically triggers an Environmental Assessment (EA). If the landfill proponent is private, there is no EA requirement.

The Ministry of Environment has significantly increased the regulatory requirements for landfill over the past decade. Draft regulation 309, in part, is a codification of the new approach taken by the Ministry. The requirements have been reflected in increased costs. The nature of the changes have included:

- . more stringent requirements for site selection, engineering, operation, closure and monitoring
- . increased hearings requirements
- . application of the Environmental Assessment Act.

This has upgraded the quality of landfills approved throughout the province. More rigorous approvals requirements have also encouraged the acquisition of larger sites. This has fit in well with the shift of disposal responsibility to upper tier municipalities.

B. Perspective on Costs

Costs of landfilling can be thought of in terms of two general components: those which the landfilling proponent -- generally a municipality -- perceives and pays under the current regulatory environment; and costs which are incurred but which do not show up on the proponent's ledgers.

The latter costs include environmental and social impacts which are not accounted for in landfill acquisition and operation. There has been increased pressure on the Ministry of the Environment to require municipalities to incorporate these costs. The move to more stringent regulation in part reflects this pressure, as does the

proposed implementation of perpetual care discussed in the Blueprint. It should be emphasized that these "external" costs will only be accounted for by the landfill proponent if there is regulatory or other pressure to do so.

The costs faced by the proponent can be broken into 3 categories:

1. Capital
2. Operating
3. Post-closure

2.1 Capital Costs

A. Land

Land costs include the provision of a buffer zone, generally 30 to 100 metres around the fill area, within the acquired site, as required by the regulations. Land values vary significantly from jurisdiction to jurisdiction and within jurisdictions, depending on alternative uses for the land. The costs for the sites displayed in Table L1* ranged from \$700 to \$105,000 per hectare. The costs per tonne of capacity range from \$.09 to \$1.19.

B. Acquisition of Approvals

Approvals costs include the legal and engineering costs associated with obtaining the MOE certificate of approval to operate. Table L1 shows a range between \$.05 and \$.55 per tonne. Acquiring the recent expansion for Halton's Burlington site cost about \$.70 per tonne. Length of hearing time and complexity of the application - especially as complexity affects the length and scope of engineering and related studies required - are two primary variables driving these costs.

*Separate land cost figures are not available for the Metro Keele Valley Site.

TABLE L1
Landfill Capital Costs
Sample Recent Acquisitions
(1984 Dollars)

	Britannia		Cornwall		Glanbrook	
	Total	Cost/Tonne	Total	Cost/Tonne	Total	Cost/Tonne
Land Costs	8,000,000	1.19	164,000	.09	1,950,000	.31
Acquisition Costs			104,000	.05	1 200,000	.19
Initial Site Works	9,300,000	1.38*	1,100,000	.57	1,400,000	.22
Total	17,300,000	2.57 =====	1,368,000	.71 ===	4,550,000	.72 ===
Tonnes	6,730,000		1 916,000		6,349,000	
	Salford		Huntsville		Keele Valley	
	Total	Cost/Tonne	Total	Cost/Tonne	Total	Cost/Tonne
Land Costs	420,000	.18	125,000	.52	42,000,000	2.10**
Acquisition Costs	1,300,000	.55	94,000	.39		
Initial Site Works	1,700 000	.72	89,000	.37	48,000 000	2.40***
Total	3,420,000	1.45 =====	308,000	1.29 =====	90,000 000	4.50 =====
Tonnes	2,353,000		239,000		20,000 000	
Average Costs/Tonne	1.87					
Maximum	4.50					
Minimum	0.71					

* Includes Site Acquisition and Initial Site Works

** Combines Land Costs and Acquisition Costs

*** Includes a significant contingency estimate - approximately \$20 million which may never be expended

C. Initial Site Works

The other major capital cost component is initial site works. These works include the building of access roads, and any additional site work required. Where the natural attenuation approach is not used, a special leachate collection system is required. In Table L1, Britannia and Metro Toronto's Keele Valley site include the installation of leachate control. Keele Valley site works costs come to \$2.40 per tonne. Other initial site work figures in Table L1 range between \$.22 and \$.72. (The figure of \$1.38 for Britannia includes an unspecified amount for site acquisition.)

D. Other Costs

Costs incurred for long term site maintenance and for compensation to local jurisdictions and/or municipalities could be included as part of the capital cost. However, where these are paid, they are normally rolled into operating costs.*

E. Total Capital Costs

As Table L1 indicates, the total capital costs for recent acquisitions range between \$.71 and \$4.50 per tonne with an average cost of \$1.87.

2.2 Operating Costs

A. Costs During Site Lifetime

Operating costs include the expenses associated with weighing incoming waste (where scales are present) dumping, burying and

*Current compensation charges vary considerably. London pays Westminster Township \$.10/tonne; Metro Toronto pays York and Vaughan about \$1.00/tonne and gave free access to the landfill for a period of time. The charges are included in the operating costs of the landfills.

covering the landfill. They also include costs of leachate collection, treatment and disposal, site monitoring and security during the site's active life.

Tables L2 and L3 contain examples of operating costs for a variety of sites with annual tonnages greater and less than 5,000.* Economies of scale are clearly evident. The weighted average of landfills with tonnages less than 5,000 is about \$15 per tonne, while the larger sites average close to \$7 per tonne. The largest sites, Britannia and Metro Toronto's two major landfills** have costs less than \$5 per tonne.

It should be noted that these costs relate to currently operating landfills, some of which may be upgraded in the future. It should also be noted that the operating costs normally do not include any provision for remedial measures undertaken during the operating site's lifetime. These normally appear in the capital budget and do not show up in operating costs. Thus, actual operating costs, especially those likely to obtain in the future when perpetual care charges may be a standard feature, could be higher than those indicated.

While the cost for each site should increase, the overall effect of the changed regulating environment on solid waste management costs may not be as dramatic as indicated by the site by site cost increases. The move to larger sites may mitigate the result somewhat.

*This tonnage break point was arbitrarily chosen.

**Keele Valley at 730,000 tonnes and Brock West at 1,200,000 tonnes are rolled together in the \$4.2 per tonne cost.

Table L2

Sample Operating Costs
Selected Sites with Annual Tonnage Less Than 5,000 (\$1984)

	Tonnes/Year	Cost	\$/tonne
Cheese Factory, Waterloo	860	16,400	19.07
Tosorontio Twp, Simcoe	1,050	15,519	14.78
Sunnidale Twp, Simcoe	1,050	8,715	8.30
Stayner, Simcoe	1,160	12,168	10.49
Ayr, Waterloo	1,320	42,626	32.29
Medonte Twp, Simcoe	2,030	33,333	16.42
Nottawasaga Twp, Simcoe	2,490	23,850	9.58
Mara Twp, Simcoe	2,580	24,241	9.40
Vespra Twp, Simcoe	2,750	24,835	9.03
Essa Twp, Simcoe	3,300	35,823	10.86
Oro Twp, Simcoe	3,570	48,850	13.68
Orillia Twp, Simcoe	3,760	85,406	22.71
Average			14.72
Weighted Average			14.34
Maximum			32.29
Minimum			8.30

Table L3

Sample Operating Costs
Selected Sites with Annual Tonnage Greater Than 5,000 (\$1984)

	Tonnes/Year	Cost	\$/tonne
Caledon, Peel	6,000	142,307	23.72
Woolwich, Waterloo	7,400	151,885	20.53
Collingwood, Simcoe	11,120	143,029	12.86
Albion, Peel	13,500	218,700	16.20
Huntsville, Muskoka	13,600	74,800	5.50
Orillia, Simcoe	19,500	165,432	8.48
Barrie, Simcoe	40,000	437,867	10.95
Cambridge, Waterloo	60,900	622,210	10.22
Waterloo, Waterloo	175,500	1,360,810	7.75
Trail Road, Ottawa-Carleton	230,000	1,112,001	4.83
London, W12A	254,000	1,957,048	7.70
Brittania, Peel	500,000	2,050,000	4.10
Metro Toronto	1,931,160	8,110,872	4.20
Average			10.54
Weighted Average			5.07
Maximum			23.72
Minimum			4.10

B. Closure Costs

This is the cost of closing the landfill and returning it to an acceptable condition for subsequent use. Metro Toronto has estimated the cost of progressive development and landscaping to be about \$3 million for its Keele Valley site. This is about \$.15 per tonne.

C. Post Closure Costs - Perpetual Care

After a landfill has finished its useful life, it continues to generate leachate and gas. To ensure environmental quality, the following is necessary:

- . Monitoring: the site requires periodic monitoring to ensure that leachate and gas are not creating problems for the natural and/or human environment.
- . Leachate collection and treatment: for many sites it is necessary to continue to collect and treat leachate over several years.
- . Gas collection and venting or flaring.
- . Environmental impairment insurance: to ensure that negative impacts on the human and natural environments can be compensated.
- . Remedial measures: It is possible that a site may require subsequent activities to ensure that environmental quality is maintained. These measures range from the installation of purge wells to tap off problematic leachate to the removal of site contents to another location.

Cost of Perpetual Care

How should the costs of perpetual care be estimated?

The costs of perpetual care are the costs of ensuring an acceptable level of environmental performance in the future, after the site has closed.

There are therefore two important issues: what is an acceptable level of environmental performance and what are the costs of ensuring it? Two kinds of uncertainty complicate this further: uncertainty about the performance of landfills approved under the current regulatory approach and uncertainty about the future costs and future standards of environmental quality.

i) Acceptable environmental performance

Following the approach to environmental quality described above, acceptable performance implies meeting MOE's standards and guidelines. The cost of acceptable environmental performance is therefore the cost of meeting these standards and guidelines.

Two approaches may be taken to dealing with the uncertainty concerning future levels of environmental acceptability. One approach is to assert that current standards will remain in force throughout the future. Following this, it is possible to estimate costs purely by estimating the future cost of meeting standards as they exist today.

A second approach recognizes the possibility that standards will change in the future. To be useful for cost estimation purposes this kind of approach must do two things: estimate the probability of standards changing and estimate the nature of future standards -- e.g., if the standards will be higher, how much higher are they likely to be? Or it can take a "conservative" approach by trying to estimate the maximum likely standard, and the maximum probability that this kind of standard will imply.

ii) Costs of Specific Measures

Meeting environmental standards past the site's operating life can mean a variety of things, depending on how the site performs. Each site requires its own analysis. However, for illustrative purposes only, an example has been worked up based on a site with a 4,500,000 tonne capacity. Table L4 presents results of the analysis.

In Table L4 leachate control costs are based on close proximity to a treatment facility. For those sites requiring leachate collection and treatment which are not within economic proximity to a treatment plant, different approaches may be possible. One approach, which the Ministry of the Environment appears to consider appropriate for some sites, is to cap the site to prevent rain water intrusion and to replace the cap and liner periodically (e.g., every 20 years). For one prospective site, the cost of this capping has been estimated at \$1.20 per tonne each time the cap and liner are replaced. The cost per input tonne to accumulate enough for the first liner replacement is \$.89. The cost per tonne required to establish a fund which could rebuild the liner every 20 years thereafter is an additional \$22./tonne. Thus perpetual care costs can be significant in certain circumstances.

- Remedial Measures: Remedial measures refer to the steps that can be taken to bring a landfill which is having an unacceptable impact into environmental compliance. A wide range of measures is possible, from ditching to bottom sealing and retrofitting a leachate collection system. It should be emphasized that under the currently tightened regulatory requirements, the probability of requiring remedial measures should be greatly reduced. If the regulations are working properly, significant future remedial work should not be required. In principle, however, perpetual care should include provision for this eventuality.

Table L4

**Sample Perpetual Care Costs
(For Illustrative Purposes Only)
1984 Dollars
Total Site Capacity: 4,500,000 Tonnes**

Annual Costs

Monitoring	\$17,000
Grounds Maintenance	7,000
Utilities	2,000
Leachate Treatment	35,000
Leachate System Maintenance	19,000
Gas Control	0
Environmental Impairment Insurance	15,000
Total	<u>\$95,000</u>

Fund Required to Maintain Care In Perpetuity
at End of Site's Life (3% real interest rate): \$3,200,000

Charge Per Tonne Input Over 20 Year Life to
Generate Fund (3% real interest rate): \$.53

iii) Total Cost of Perpetual Care

The total cost of perpetual care for a landfill can be expressed as:

$$PP = M + L + R$$

Where:

PP = Present value of the total cost of perpetual care for landfill stated as at the first post closure year,

$$M = \sum_{i=1}^N \frac{M_i}{(1+r)^i}, \text{ where } N = \text{number of years monitored, } M_i \text{ is the cost of monitoring in year } i \text{ and } r \text{ is the discount rate.}$$

Where $N = \text{"perpetuity"}$ and M_i is constant in real terms, M is simply: $\frac{M_i}{r}$

$$L = \sum_{i=1}^T \frac{L_i}{(1+r)^i}, \text{ where } T = \text{number of years for which leachate collection and treatment considered, and } L_i \text{ is the cost of leachate collection and treatment in year } i. \text{ Where } T \text{ is "perpetuity" and } L_i \text{ is constant in real terms, } L \text{ becomes } \frac{L_i}{r}$$

$$R = \sum_{i=1}^P \frac{R_i}{(1+r)^i}, \text{ where } P = \text{number of years for which remedial measures are considered, and } R_i \text{ is the cost of remedial measures implemented in year } i.$$

Implicit in the above formulation is the assumption that the costs can be estimated in each year for each of these elements. Another way of looking at it is that each of the M_i , L_i and R_i are expected values, estimated in probability terms. These estimates implicitly incorporate considerations of the level of future standards.

The costs of perpetual care have been calculated in Table L4 to illustrate the methodology employed. They are presented for illustrative purposes only, and are not meant to substitute for an analysis of perpetual care costs on a site-by-site basis in Ontario.

How should the costs of perpetual care be allocated and paid for? Who should pay for the costs of perpetual care? In what form should that payment be made?

Using simple principles of equity, the payment for perpetual care should be made by those responsible for depositing the solid waste over the site's lifetime. In terms of municipal costing and budgeting, it is an item which can appear in one or two different ways. A fund can be created by allocating part of the landfill's operating budget over the operating lifetime; for example, on a tonne-by-tonne basis; or the fund might be created by capitalizing it as part of the landfill's original cost. That portion of the debt would be retired with the rest of the capital cost over the landfill's lifetime; the fund would accumulate interest over the landfill's lifetime. The objective in either case is to have a fund established which can finance the cost of care over the post closure period of the site's lifetime.

Table L4 provides an estimate of both the fund needed at the end of the site's lifetime to provide for perpetual care and the tipping fee charge required to create the fund. All figures are expressed in real terms.

Transport and Hauling Costs

The cost of solid waste management includes haul costs to landfill. The distance to landfill is obviously the most important determinant of the nature of these costs. For longer distance hauls, where it makes more economic sense to use tractor-trailer units, transfer facilities must be

constructed. Costs per tonne/minute for packers are estimated at \$.15 for a packer and \$.06 per tonne/minute for tractor trailer units.

These costs can be significant. For example, recent work on Waterloo's solid waste management options indicated transport and haulage costs of \$5 - \$10/tonne for most options. For the option which hauls a major portion of Waterloo's waste to Occidental Chemical in New York, the cost/tonne is over \$12 (excluding the cost of transfer station construction and operation).

Collection Costs

Collection costs vary widely, depending upon frequency of pickups, crewsize, haul distance to landfill, etc. Table L5 from the Municipal Affairs and Housing survey show figures mostly in the \$20 to \$30 per tonne range.

2.3 Future Landfill Costs

Future costs are likely to increase; the following factors are most relevant.

- . Acquisition Costs. Environmental assessment, because of its wider requirement for public participation is likely to mean increased costs. The Salford and Burlington costs of \$.55 to \$.70 per tonne are more likely to be the norm than the much lower costs indicated in Table L1. However, if the Environmental Assessment Board manages to streamline the process to focus in on the most relevant issues, cost increases may be mitigated. More experience with the process is required.

TABLE L5
COLLECTION COSTS

Municipality	Total Tonnages	Total Expenditures	Cost/Ton
Brantford	20 600	385,700	18.72
Port Colborne	15,600	182,643	11.71
Sault Ste. Marie	23,379	685,108	29.30
Peterborough	9,800	434,542	44.34
Barrie	11,085	262,365	23.67
Guelph	21,089	360,000	17.07
Ottawa	113,294	3,347,271	29.54
Cornwall	51,397	451,032	8.78
St. Catharines	43,378	1,315,000	30.31
Toronto	266,537	14,819,582	55.60
Etobicoke	110,068	3,127,306	28.41
Chatham	13,000	610,750	46.98
Owen Sound	3,000	127,000	42.33
Kingston	30,000	745,243	24.84
Kitchener	43,670	891,304	20.41
Cambridge	21,785	539,251	24.75
Brampton	46,731	1,457,692	31.19
St. Thomas	35,000	164,805	4.71
Totals	879,413	29,906,594	34.01

- . Compensation. Both compensation to individuals and groups affected by the landfill's construction and operation and compensation to municipalities landfilling waste from outside their jurisdiction are likely to play a much more prominent role in the future.
- . Site Engineering. More highly engineered sites which are in keeping with tightened environmental regulation, mean higher capital and operating costs -- leachate collection system installation and maintenance, leachate treatment costs, etc.
- . Haul Costs. Public pressure will increase the tendency for sites to retreat from the most populous areas. Large hauls can increase costs significantly.
- . Perpetual Care. Depending on the Ministry of the Environment's stance, perpetual care costs could play a prominent role in the future. For some sites with good attenuation characteristics, no potential ground water contamination problems and/or close proximity to cheap leachate treatment, perpetual care may not be economically significant. For other sites, without these characteristics, however, perpetual care requirements could render the sites uneconomic.

3.0 Solid Waste Management Savings

EFW can save disposal costs and transport costs to landfill. Reduction, reuse and source separation can save these, and collection costs as well.

The value of these savings is the difference between the total cost of the system without the alternatives and the total cost of the system with the alternatives. To determine these savings it is necessary to calculate what the cost of the system will be when the alternatives are added in. (This calculation is done assuming that

the solid waste management authority makes no "tipping fee" or "diversion credit" payment to the EFW or source separation system operators. It is this calculation which helps to determine how much the municipality is willing to pay in the form of a tipping fee or diversion credit.)

The savings to the solid waste management system of adopting an EFW plant and/or incorporating source separation are the decreases in the cost of operating the waste management system - the net changes in disposal costs, transport costs and collection costs.

The savings calculated are highly dependent upon the configuration of the system into which these alternatives are to fit. For example, in the case of disposal cost savings attributable to EFW, it is theoretically possible that an EFW plant will eliminate the need for a complete landfill - for example, if the proposed system had more than one landfill, one of whose capacity were equal to the EFW plant's waste reduction. In that case the EFW plant's disposal savings value to the system would be the total cost of acquiring and operating that landfill. The savings on a tonnage basis terms, would be equal to the tipping fee charged at the landfill (if the tipping fee were based purely on cost).

Seldom is it quite so straightforward, however. Because the introduction of EFW usually means a decreased use of one landfill rather than its elimination, determining the actual disposal savings requires an evaluation of how that change would actually manifest itself in cost decreases. Some of the landfill operating costs are clearly fixed, some are variable. Some of the variable costs (e.g., labour, equipment) are not completely variable - e.g., a 10% decrease in volume handled may not result in a 10% lower labour requirement. Each situation has to be examined separately.

This is true too, though to a lesser extent, for transportation cost savings. Decreased distance to the EFW plant means decreased time

in travel. But because trucks and labour are not completely variable, cost savings may not correspond directly to the decreased distance hauled.

Collection cost savings are subject to the same considerations. A decrease in volume collected due to source separation or reduction, does not normally decrease the number of pick ups which a solid waste vehicle makes. It does, however, lower the total load size. Lower total load size should mean fewer trips to the transfer station or landfill. Whether the increased time available for collection routes can be translated into savings by reorganizing collection routes, and eliminating trucks and labour, depends on system parameters.

An overriding concern is the dependability of the changes which take place in system. The landfill operating, transport and collection savings all depend upon cutting down on labour and equipment. This can only be done if planned properly on the basis of an ongoing specified level of landfill quantity reduction requirements.

These considerations are taken up below in the description of diversion credit calculation.

3.1 Diversion Credit Calculation

"Diversion Credit" is the amount paid to a waste management alternative such as EFW or Source Separation to reflect the savings in the collection, transport and disposal of the solid waste remained to be handled by the system. A "full" diversion credit is one which transfers the total savings to the alternative. The calculation of a "full" diversion credit is discussed below*.

*The following assumes that landfill will be saved, and therefore form the basis of the credit. However, strictly speaking, the credit should be calculated to reflect savings to the system of incorporating an alternative. Thus, in calculating a diversion credit for source separation in a system which includes EFW, it is appropriate to account for

Approach to Calculating a Full Diversion Credit

In principle the calculation of a diversion credit is straight forward. The credit should embody all of the cost savings obtained by a solid waste management system in utilizing an alternative to landfill.

Cost of System With Alternatives

$$M = \sum_{i=1}^N \frac{K_i + O_i + T_i + C_i}{(1+r)^i}$$

M = Present value of cost of system without alternatives

K_i = Landfill capital cost in year i

O_i = Landfill operating cost in year i

T_i = Cost of transporting waste to landfill in year i

C_i = Cost of collecting waste in year i

r = Discount rate

N = Evaluation horizon

Cost of System with EFW and/or Source Separation

$$A = \sum_{i=1}^N \frac{KA_i + OA_i + TA_i + CA_i}{(1+r)^i}$$

A = Present value of system cost with alternatives

KA_i = Landfill capital cost with alternatives installed in year i

OA_i = Landfill operating cost with alternatives installed in year i

TA_i = Cost of transporting waste to landfill with alternatives installed in year i

CA_i = Cost of collecting waste with alternatives installed in year i

EFW savings impacts - e.g., downsizing.

r = Discount rate

N = Evaluation horizon

Therefore, the present value of the cost savings (S) associated with installing the alternatives is:

$$S = M - A$$

The value of a diversion credit, paid annually over the operating life of the alternatives would be equal to D_0 in the formula below:

$$S = \sum_{t=1}^J \frac{D_0 (1+p)^t}{(1+r)^t}$$

S = Savings of the alternative

D_0 = Diversion credit in base year

p = Inflation rate

r = Discount rate

J = Lifetime of alternative.

In order to replicate the cash flow savings to the municipality, the diversion credit should be calculated by separating the capital component, which is debentured and upon which interest charges would be paid, from the operating component which generally comes from the operating budget.

The diversion credit, set to increase at the rate of inflation, is then:

$$D = C + O$$

Where O = annual operating savings

C = capital savings, annualized to repay capital and interest over the lifetime of the alteration.

Capital Savings

There are different approaches to calculating capital cost savings. These differences are reflective of the fact that the capital cost saving opportunities are not uniform. For example, a 4Rs option may save the need to acquire one landfill. In this case, the savings per tonne are the total capital cost of the landfill divided by the total tonnage. In another case, the impact will be to delay the time at which the next landfill is acquired - but not to change the size or location of that landfill. In this case, lifetime extension means only that the full capital cost of the next landfill(s) is incurred later on in the system's lifetime. Time is money. The value of the savings depends upon the length of the extension, the cost of the next landfill and the cost of money (discount rate). In the formulae above, this is equivalent to the differences in the present value of the K_i and KA_i , but adjusted to reflect the fact that subsequent landfill acquisition would be similarly affected. The length of the landfill extension depends upon the quantity of material diverted and the proportion of total landfill capacity savings which that constitutes.

In another situation, the size (and perhaps location) of the next landfill will be affected. In this case, the combined effects of delay and cost difference have to be factored in.

The computerized evaluation framework permits the savings to be calculated under these different situations.

Operating Savings

Landfill operating savings involve decreased labour and equipment requirements for dumping and burying, site maintenance, etc.

Calculations were done for London's savings associated with the Victoria Hospital EFW plant. The plant would save about 30% in the volume of

material going to landfill. At that time it was calculated that total operating costs would be reduced through a 30% reduction in dumping and burying and site maintenance. Reductions of 20% could be expected in leachate removal and operating supplies. Other cost items would have a 0 reduction. The total savings would be about a 25% reduction in costs for a 30% reduction in volume. This would come to about \$3.00 (1984 dollars) per tonne.

When the Agreement between the Hospital and the City was opened up to public scrutiny once more in 1985 (see the discussion in Appendix 4 of the Victoria Hospital EFW approval), the City reexamined the figures and determined that the potential savings had been overestimated. They stated that \$1.36 was the maximum saving that could actually be realized and about 25% of this would be capital related and not show up in the operating budget. Thus, a 30% saving volume saving would decrease costs by less than 15%. This is obviously a contentious issue which can have a major impact on tipping fee and diversion credit calculations.

A model has been prepared to assess the implications of different volume/cost reduction ratios for landfill operating costs.

Transport Cost Savings

Reduction, reuse and source separation save costs of transport to landfill. Major savings can also result from decreases in the distances between the resource recovery or EFW plant and the landfill. In the case of Victoria Hospital, about \$2.20 per tonne would be saved (assuming the system could take advantage of the distance difference by decreasing labour and equipment to the maximum amount possible).

In the case of Waterloo, MacLaren has calculated savings of \$4.50 to \$13.50, depending on the location of the next landfill.

The value of the saving is obviously highly dependent on the relative locations of plant, landfill and transfer facilities. For EFW, the closer it can be located to the source of waste generation, the greater will be the transport savings credit. This can conflict directly with public opposition to plant locations in more populated areas, and can be the key to plant economic viability.

Collection Cost Savings

Unless the decreased volume collected due to reduction, reuse or source separation is large, the number of pick ups and the time spent on these picks ups does not usually decrease. However, lower total load size should mean fewer trips to the transfer station or landfill. This should increase the amount of time spent on the collection routes and thus reduce the total time required to collect refuse. However, whether or not time requirements will be decreased depends on the capacity of the vehicle, the average size of the final load taken to landfill, and so on. Similarly, whether the increased time available for collection routes can be translated into savings by reorganizing collection routes, and eliminating trucks and labour, depends on the specific manner in which collection is undertaken, the nature of the routes, availability of slack time, etc.

Post-Closure Savings

It is not clear what the marginal impact of source separation and EFW would be on actual post closure costs. If perpetual care costs were levied on a tonnage basis -- with no attempt to correlate changes in perpetual care costs to changes in wastestream diversion -- then each ton diverted would save the full perpetual care charge.

Solid Waste Management Savings from Alternatives: A Summary

The economic savings from the 4Rs are highly system and site dependent. Going on the basis of most recent acquisitions, maximum capital cost savings will be between \$.70 and \$4.50*. Landfill operating costs vary widely. At the larger sites -- there is a trend to the acquisition of larger sites (where they can be found) -- they range between \$5 and \$10 per tonne. In the case of reuse, reduction or source separation, a 10% reduction or less may not result in significant operating savings -- it may be difficult for the system to decrease equipment or manpower appreciably to take advantage of the lower tonnage. Since EFW and resource recovery can have a much greater diversion impact,** landfill operating cost savings may be more significant. It depends on the percentage diversion and the system's flexibility. Based on current evidence, the economic impact of perpetual care is not likely to be large for most sites. However, it could be a decisive economic barrier for sites with special problems.

Haul cost savings for both source separation and EFW can be very significant. For reduction, reuse and source separation, the saving is unambiguous -- the full cost savings of transport to landfill. For EFW and material recovery, it can be positive or negative depending on plant site location compared to the source of waste and location of landfill.

3.2 Implications for Decision Making

The above approach to calculating diversion credits, landfill savings, etc. is based on the attempt to capture the true cost changes to the waste management system occasioned by the

* Excluding carrying charges.

** At currently assumed feasible levels of reduction, reuse and source separation.

introduction of EFW and source separation. But this cost signal may not be the one which the decision maker receives, because the decision to divert waste is not always made by the authority who will experience the real cost changes. For example:

- To a waste hauler paying for disposal on a tonnage basis, the disposal savings associated with diverting a tonne of waste is equal to the tipping fee paid. That tipping fee is usually based on "average cost plus", a higher figure than the marginal savings to the disposal site of not having that tonnage delivered. This gives a stronger economic incentive to the 4Rs than would an "avoided cost" based approach. The operator of the landfill will lose on this basis because the lost revenue is higher than the avoided cost.
- To an area municipality which pays a fee to a higher tier municipality based on tonnes diverted will also have a stronger economic incentive than avoided cost.
- To an area municipality not paying for disposal costs via a tipping fee, but through some other mechanism - e.g., a general tax assessment, there is no direct economic incentive to engage in the 4Rs.
- To the landfill owner and operator, the decreased costs are precisely the marginal cost saving discussed above. It should be noted, however, that the revenue position can change after the implementation of a 4Rs alternative. The increase in unit costs resulting from the drop in volume, but disproportionate drop in costs, may be recouped by increasing tipping fees. In other words, the users of the landfill after the 4Rs implementation will be charged more per unit than before. They are in effect "paying a price" for not engaging in 4Rs activity.

In any case, marginal savings calculations are difficult to understand and hard to estimate accurately. They frequently involve

matters of judgment. Once a change is made - e.g., once source separation is adopted - it can be virtually impossible to trace through its cost implications. There are simply too many variables; it is impossible to unambiguously sort through "might have beens" for the full landfill solid wastestream not adopted.

Actual economic savings are only one consideration in the decision to support landfill alternatives. If local authorities are generally in favour of the 4Rs than they will ignore or accept the marginal savings concept on the basis of what they want to do and what is saleable politically. Marginal costs savings are virtually incomprehensible to the non-initiated. Average costs appear clear. A premium over and above whatever the officials decide to define the saving to be (average or marginal cost) may be politically advantageous, or convincing on its own merits.

These are the considerations which will drive the decisions of those who are convinced that alternatives to landfill should be actively supported. The diversion credit selected may be, therefore "average cost plus an \$X premium", or "marginal cost savings plus an \$X premium", or even "\$Y, because it looks like this is what the 4Rs option needs to be viable".

The diversion credits paid and proposed in Ontario are instructive in this regard. Peel's \$4 appears to be based on a (marginal) cost savings calculation, Pelham's was apparently based on the mayor's decision independent of a special cost analysis. Halton's credit escalating to 2/3rds of the landfill tipping fee, seems to have been based on what was considered necessary to give adequate support to the source separation efforts in the region.

Those who are reluctant to support alternatives are likely to pay much more attention to actual savings calculated on a marginal cost basis. These are the municipal officials who need to be convinced

in terms of "the bottom line". (Perhaps because they are not engaged in the effort to acquire another landfill.) They need to identify cost savings which are clear and identifiable in municipal budgetary terms. In the absence of a special staff or consultant's opinion, what counts is what it is the municipal accounting system shows the costs to be. Many of the relevant items do not show up on the operating accounts. For example, the capital charges related to the landfill are usually rolled, undifferentiated, into the general capital budget, with no separate identification of what the landfill capital charges are. So it does not show up separately anywhere, and it does not have a direct impact on the politician's day-to-day budgetary consciousness. In these terms, it is a sunk cost and does not really have much bearing on current decisions - it cannot be changed by anything that council does now. It is only future capital expenditures that will be affected by what is done today and tomorrow.

This is true for some of the cost elements which relate to operating the landfill site. Some of these, such as progressive development, are not done each year, but occasionally as required. These are often included in the capital budget and so, less visible, appear less valuable (if they are debentured over 15 years, the annual charge is much less than if they are calculated to be paid as incurred) and make less of an impression as a cost saving.

A key distinction here is whether the municipality is in planning mode or not. In planning mode, the consultant hired by the municipality will attempt to identify the true cost savings of the alternatives by looking into the future and examining the impact of the alternatives, based upon projected capital and operating costs. Municipal budgets mean very little for these calculations, except in-so-far as a record of past and current costs provides a useful and accurate guide to what expenditures are likely to be in the

future. The capital and operating costs estimated by the consultant refer to alternative variants of proposed and possible systems.*

Planning studies should put the relative merits in perspective, by expressing all of the costs in present value terms. This clarifies what the alternatives truly cost over the lifetime of the planning horizon. It is true that politicians may still want to know the cost implications for the next 3 years, and may choose to make decisions on that basis. But at least the full cost implications are out in the open and the choice to ignore them is clear and done at the politician's political peril. This is one of the great merits of EA and master planning.

*An accounting system which identifies each of these elements properly can help to highlight the current costs of waste management for the politician. But their relevance for planning decisions is limited.

APPENDIX 2

MUNICIPAL DECISION MAKING AND THE 4Rs/EFW: FINDINGS FROM THE INTERVIEWS

APPENDIX 2

MUNICIPAL DECISION MAKING AND THE 4Rs/EFW: FINDINGS FROM THE INTERVIEWS

1.0 Introduction

In undertaking this study, interviews were conducted with elected and appointed municipal officials and a review was made of the relevant municipal decision-making literature. This appendix is a consolidation of our findings from these activities.

2.0 The Municipal Role*

In Ontario, municipalities are direct and substantial players within what is referred to as the municipal solid waste management system. They have been delegated various responsibilities by the Province to collect, remove, and dispose of residentially generated wastes, non-hazardous commercial and industrial wastes and sewage sludge. These assignments of authority are of long standing. As a result, roles have been established, major capital investments have been made, and what are considered appropriate procedures have been put in place.

We found that this past history significantly influences the attitudes and decision-making of municipal officials toward waste management, in general, and the 4Rs/EFW, in particular. Specifically, we learned that:

*Respondents suggested that the term "municipality" was used too loosely in the "Blueprint for Waste Management" and reference should be made to the definitions in the Municipal Act and the Planning Act 1983. "Municipality" has been defined in the Municipal Act (Section 1, subsection 18, chapter 382, R.S.O. 1980) to mean a locality, the inhabitants of which are incorporated and in the Planning Act 1983 [Section 1, subsection (g)] to mean a local municipality, a county and a regional, metropolitan or district municipality. "Local municipality" means a city, a town, village and township [Section 1, subsection II] of the Municipal Act and Section 1 subsection(d) of the Planning Act 1983. In this appendix, we occasionally refer to local municipalities as "lower-tier" municipalities and to counties and regional municipalities as "upper-tier" municipalities.

- . Most municipalities view their role strictly as administrators of the assigned legislation on waste management and thus service providers to the citizens of their community. It is their function to collect, remove, and/or dispose of the waste, no more and no less.
- . The means selected to implement their responsibility is primarily motivated by the standards and regulations imposed by senior levels of government, by financial considerations, by the political pressures from local citizens and by the desire to establish longer term solutions to the waste management problem.
- . Municipalities with waste disposal responsibilities have much greater motivation to reduce the volume of waste than those who don't. All indicated they are considering:
 - increasing tipping fees
 - assigning charges on a tonnage basis (where not in place now)
 - diversion credits
- . Municipalities with waste collection responsibilities are primarily motivated to reduce the volume of waste destined for disposal when there is one or all of: a significant increase in tipping fees, pressure from local citizens and environmental groups, and prospects of a landfill site in their community.
- . Where a municipality is implementing its responsibilities using its own civic employees, decision-making is strongly influenced by known and acceptable technologies and by inputs from their local unions. Accordingly, most capital investments have been traditional facilities -- compactor trucks, transfer stations, large haulage trucks, and landfill sites.
- . Where municipalities are contracting for services and risks are

reassigned, alternatives such as separated trucks, energy from waste projects etc. might be considered.

- . Generally, municipalities do not consider themselves to be in the commercial side of waste management -- i.e., energy providers, waste separators, recyclers, and marketers. They have been reluctant to pursue EFW alternatives for four reasons:
 - lack (or uncertainty) of customers
 - fear of financial risk
 - environmental concerns about air emissions
 - little faith in techniques
- . The driving force to undertake waste management planning is either the lack of suitable landfill or a negative impact of landfill on ground water.
- . Waste management planning has been and continues to be oriented to locating and operating landfill sites.

3.0 Jurisdictional Assignment

All three levels of municipal government (local, county, and regional) have been authorized to undertake differing but specific responsibilities. However, the assignment of responsibilities between regional governments, between regional or county governments and local governments or between local governments is not consistent.

Specifically, we observed the following:

- . Generally, local municipalities have been given permissive authority to plan and operate waste management services. The Municipal Act states that "By-laws may be passed by the councils of local municipalities for establishing and maintaining a system for the collection, removal and disposal of ashes, garbage, and

other refuse. (The Municipal Act Section 208, subsection 5, Section 210, subsections 83-86 and Section 210, subsection 129.)

- . However, some local municipalities have had parts of this authority overridden by specific legislation establishing certain counties and regional municipalities where two levels of government co-exist. Specifically, in matters related to waste disposal, authority to dispose of wastes continues but only with consent of either a regional or county government. In many of the geographic areas where upper tier county or regional municipalities exist, responsibility for waste disposal has been assigned to the upper tier. Conditions governing the operations of all waste disposal facilities can be found in sections of the Environmental Protection Act, the Ontario Water Resources Act and appropriate provincial statutes.

The majority of the population in Ontario live in areas where the responsibility for waste management is shared. This division of responsibility is important for it often impedes the introduction of waste management alternatives. What must be remembered is that each level of municipal government has different responsibilities and, contrary to much popular opinion, the two levels of municipal government (regional and area) generally are not hierarchical in matters related to waste management. While some regions do have means (tonnage charges and diversion credits) of encouraging area government to reduce the volume of waste destined for disposal, generally regional municipalities must accept and dispose of all wastes received from an area municipality. In many matters related to waste management the two levels can and do act rather independently. We have observed that it is only through conscious effort of one of the parties that collaboration and co-operation occurs.

Throughout our interviews we found respondents questioned this arrangement. They suggested the following:

- . The fragmented allocation of responsibilities between regional, county, and local governments will continue to create significant institutional barriers which will necessitate lengthy negotiations and, in general, will frustrate rapid implementation of the 4Rs.*
- . Responsibilities for all aspects of waste management should be assigned to the upper tiers when two levels of municipal government co-exist. Where appropriate the collection responsibility could be delegated back to the area municipalities or contracted out.

The current assignment of waste management responsibilities is clearly illustrated in Chart 1.

4.0 Municipal Powers

Municipal governments in Ontario, as elsewhere in Canada, have no distinctive constitutional base. They are truly "creatures of the province" with their existence, authority, and responsibility being determined by provincial statutes - primarily the Municipal Act but also other relevant provincial statutes. The powers provided to municipal government are both mandatory functions which must be performed, and permissive functions which may be performed at the discretion of municipal government. While municipal government is essentially subordinate to the provincial government there is considerable debate as to whether it should be regarded merely as an administrative arm of the provincial government. Clearly, local governments have some autonomy, but it is never complete.

Beyond the actual jurisdictional assignment outlined in the previous section, there are questions about the powers associated with assigned responsibility. This again is inconsistent. For some municipalities

*Only experience will tell whether delay will be reduced.

Chart 1: Municipal Solid Waste Management Roles and Responsibilities

Municipality Name / Type	Waste Disposal Sites	Waste Collection	4 R's	Powers to prevent others from disposing	Powers to build outside boundaries	Garbage Truck Routing	O M B Role
Halton, Durham, York Regions	Mandatory obligation to establish	No	Yes, but not York	Yes	No	Can approve area munic. routing plan	Hears persons who have been turned down on a site by Region
Area municipal powers in Halton & Durham Regions	Only with the consent of the Region	Yes	No	No	No	Measure of control on local roads	Hears disputes between area munic. & Region on truck routes
Oxford City, Waterloo, Sudbury, Peel, Halton-Harford, Hamilton-Wentworth Regions	Mandatory obligation to establish	No	No, except Waterloo	No	No	No	None
Area municipalities within the above	Precluded	Yes	No	No	No	No	None
Ottawa-Carleton Region	Mandatory obligation to establish	No	No	Yes	No	Can approve area munic. routing plan	No O M B appeal on site refusals by Region
Area Municipalities within Ottawa-Carleton	Only with the consent of the Region	Yes	No	No	No	Can control routes on local roads	Regional truck refusals of area munic. plan heard by O M B
Niagara Region Muskoka District	May at the request & with agreement of area munic.	No	No	No	Yes	No	O M B hears if area munic. or District or Niagara attempts to build outside of upper tier boundary & area munic. objects
Area municipalities within the above	Yes	Yes	No	No	Yes	No	
Metropolitan Toronto	May establish sites	No	Yes	No	Yes	No	O M B holds hearings when Metro fails to receive consent of local host munic. for site establishment
Lower tier municipalities within Metro Toronto	May with the consent of Metro Toronto	Yes	No	No	No	No	
Counties	No	No	No	No	No	No	
Municipalities within Counties	Permissive May build sites	Yes	No	No	Yes	No	Hearings if host munic. outside of proposed munic. does not agree to site
Separated municipalities within Counties	May build sites	Yes	No	No	Yes	No	
Municipalities outside the Regional / County structure	May build sites	Yes	No	No	Yes	No	

there exists a mandatory obligation to establish waste disposal facilities while for others the authority is strictly permissive. With respect to 4Rs/EFW, there is no mandatory requirement or even explicit permissive authority to establish alternate waste management programs.

When examining municipal powers, one cannot help but ask whether more authority is needed or whether other appropriate legislative changes would provide the needed impetus for alternatives. This is a reasonable question when it is recognized that:

- . Even the courts have interpreted the granting of power to municipalities to mean that municipalities have limited powers and specific authority must be found in enabling legislation before an action can be taken. A municipality cannot act on substantive municipally generated policy and programs without provincial sanction.
- . The current waste management legislation, by implication, is heavily weighted toward landfill sites and procedures. Without mandating the means of implementing waste management alternatives the province may find it useful to at least embody a list of acceptable alternatives for collection and disposal within the existing permissive legislation. This could be codified under the Environmental Protection Act, or be spelled out in guidelines for Waste Management Master Planning.

What becomes apparent from studying the powers and practices of municipalities is that public and governmental dissatisfaction related to waste management actions is directed primarily to the means that municipalities have selected to implement their responsibilities. This is the area of discretion that has been left to the municipalities. It is the area where value judgements must be made, political alternatives must be considered, and financial resources must be allocated between competing functions in service delivery. It is also one of the many areas where local governments must make difficult decisions about land

use and deal with the "not in my back yard" (NIMBY) syndrome which is prevalent in numerous municipal decisions.

Based on our interview findings, two significant observations can be made about the assignment of powers and the implications for increased utilization of waste management alternatives.

- . Without explicit mandatory requirements to implement 4Rs/EFW programs, these will inevitably follow the route of most discretionary municipal programs -- debate will be long, implementation slow and spotty, and commitment of resources will probably depend on considerable public pressure. However, on the positive side, communities will assume some ownership and support will probably be greater than if the alternatives were mandated by the Province. Inevitably following this course, government will have to show patience while at the same time offering support.
- . As long as municipalities have discretionary authority about the means of implementing waste management responsibilities, then municipal government decision making will be strongly influenced by certain ends which are prescribed -- i.e., environmental standards and regulations, financial responsibility, etc.

Clearly a debate is raging on whether discretionary powers should be left with municipalities, action should be mandated, or some other approach considered.

Four positions were presented:

- . Don't tamper. Supporters of this position are strong advocates for municipal responsibility. They argue that municipalities regularly make value judgements and NIMBY decisions. Waste management decisions are no different. Given time, municipalities will respond with programs that meet the community

needs and objectives within the constraints of their available resources. If anything this group argues that municipalities should be given more explicit authority to establish 4Rs/EFW programs.

- . Mandate 4Rs/EFW requirements within existing assignment of responsibilities. Supporters of this position believe that municipalities lack the ability, motivation, and power to make decisions and to implement programs in the long-term interest of the environment. Mandatory obligations to implement 4Rs/EFW programs are required.
- . Provide incentives. Supporters of this position believe that the powers are appropriate but the stimulus, in terms of financial support and citizens' interest, is insufficient to move a municipality in the direction of the 4Rs/EFW. They suggest that, if in the provincial interest, the Province wants municipalities to make decisions to choose more costly systems, then appropriate incentives (conditional grants) should be used to encourage activity or increase the power of some interest groups.
- . Make waste disposal a provincial responsibility. Advocates of this position believe that the magnitude of waste disposal requirements and the lack of inter-regional cooperation necessitate a provincial rather than regional solution to the waste management issues. Supporters suggest that the province provide provincial EFW and landfill sites and mandate area municipalities to have source separation programs.

There is no doubt that the discretionary powers assigned to municipalities, the use of these powers and the possible undermining effect of the province's environmental approvals process is at the heart of the controversy surrounding municipal waste management processes. It is the discretionary areas and the application of this discretion that creates the greatest sensitivity with local citizens, brings the NIMBY

arguments to the forefront and creates the lengthy debates at local councils. Layer on top of this an approvals process that can potentially undermine the municipal discretion and it becomes evident why municipal officials expressed considerable concern about the obligations assigned to the municipal government. Against this background many municipal officials believe that legislative changes are necessary to clearly signal the province's wishes with respect to the 4Rs/EFW and to ensure that the appropriate legislative authorities are in place to allow municipalities to develop programs that are consistent with the 4Rs/EFW.*

5.0 Decision Making and the 4Rs/EFW

Our attention will now turn to the decision-making process at the municipal level. Although local government is more open to scrutiny and is more participatory than the senior levels of government, the way in which it actually operates and makes decisions is often difficult to follow. In view of its complex organizational structure of council, committees, departments, and agencies, this is not surprising. As indicated previously, within the limits of its authority and resources, each municipal government has some autonomy but normally is required also to interact with many other local government bodies, and the provincial government in order to perform its allotted functions. From many different sources, including individual citizens and other government bodies, it may receive inputs which range from specific and operational matters to those of general policy. It handles these inputs in a decision-making process generally characterized by time-consuming meetings, mounds of paper, the referral of items upwards and downwards within the structure, the multiple approval of decisions and the lack of sharp distinction between the roles of elected officials and senior employees.

*For example, Section 28 of the Environmental Protection Act may require revision to permit municipalities to establish "reserve" funds for future waste management projects which reflect 4Rs objectives and which capture true waste management costs.

There is no doubt that municipal decision making is slow and results from four main characteristics, each of which warrants thoughtful consideration in strategy formulation. These four include: the breadth of municipal program responsibility, the central role of council, the committee and administrative structure and the access provided to outside intervenors including other governments and public interest groups.

Municipal governments provide a wide range of programs and a variety of services which can be conveniently grouped into eight categories: utilities (works), transportation, land use, health and welfare, education, culture and recreation, housing and community protection. Waste management is a sub-component, usually of the "works" functions. As a result of this positioning we found that:

- . It has traditionally been a service area receiving routine consideration only at times of budget review and contract negotiations.
- . It has been of low priority compared to the high profile items of roads, social programs, parks, and public protection. Only recently, primarily as a result of media attention and public pressure, has it received increasing notice.
- . The degree and focus of decision making on waste management planning/waste management alternatives directly relates to the status of a municipality's landfill capability. Without a landfill crisis, waste management -- in competition with other services -- has generally had a low priority on the municipal agenda and has not been given serious consideration.
- . Until recently, advanced waste management planning has not been a process embraced by council unless such planning and

consideration of alternatives was promoted by the appropriate civic department or by a citizens group.

- . It is now perceived that the requirements of the Environmental Assessment Act and the Ministry of the Environment's support for master planning is slowly changing the orientation of municipal councils towards developing waste management plans.
- . The time period for councils to accept the need to consider alternatives beyond landfill is up to five years from the start of a planning process.

Decision making at the municipal level is highly centralized. The system is perhaps analogous to an hour glass. Directives, proposals and suggestions for new or modified policies and programs are made to municipal bodies by a variety of sources. Since all the major decisions affecting action at the municipal level of government must pass before council, (regardless of whether or not they can alter such decisions) the councils act like the neck of this hour glass. Once a decision is approved by council (and where necessary by the province), it can be implemented. At present municipalities are required to exercise most decisions by way of a by-law passed by council. This requirement hampers decisions in that it requires council to focus its attention on a vast number of matters, including the most minor ones.

In strategy formation, the province must be cognizant of the restrictions of council decision-making and the competition waste management programs face from other municipal authorities. Accordingly, it is imperative that in terms of the municipal politicians, the strategy focusses on their needs for:

- . financial accountability
- . responsiveness to community needs
- . clear direction on permissive powers

To process the volume of work, municipal governments have established standing committees of council. These committees are normally set up to oversee the operations of the line departments of the municipal corporation - including the works department. These are influential bodies but have limited authority; only a full council can pass by-laws. The line department head (usually known as the Commissioner) reports to his/her appropriate committee of council in technical operational matters. The Commissioner and his/her employees provide significant input to the decision-making process. They have special expertise and knowledge of both technical matters and provincial statutes which the elected official often lacks. They provide technical support to standing committees and council. Most significant proposals come through the departmental heads. This is often done at the time when budgets are set because it is at this time that resources are sought for their ideas.

Recognizing the influence of senior civic officials, it is important in strategy formulation to:

- . provide civic administrators with a clear understanding of the province's intentions concerning waste management alternatives including:
 - proposed legislative changes or interpretation of discretionary powers
 - changes in funding
 - recognize civic administrators needs for:
 - . sound technical information on alternatives
 - . recognition for major accomplishments.

Local government is participatory in nature. It not only provides access for citizens but also actively encourages their involvement.

Municipalities often establish ad hoc citizens advisory committees, as has already happened on the waste management issue in many municipalities, to provide an added perspective to input received from civic officials or to review proposals from the provincial government.

Individual citizens and citizens groups will frequently initiate many program corrections and modifications and are a major source of support to elected officials in planning and development decisions. This quality of municipal decision-making must be capitalized upon in strategy development. In particular, the province could:

- . Increase information and education efforts to and through local citizens groups.
- . Increase funding for citizens involvement in local study programs.
- . Increase funding for voluntary demonstration projects.
- . Ensure citizens groups are provided with accurate information on the environmental and health issues associated with waste management alternatives.

APPENDIX 3

THE MUNICIPAL ACTOR: BACKGROUND NOTES AND CONSIDERATIONS

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3.0 Introduction

The following should be noted about municipal decision making when considering possible government activities:

1. Dominated by local concerns. The municipal mandate is local. Their concerns reflect this. With some exceptions (unusually far-sighted politicians, for example).
2. Routine versus non-routine decisions. Municipalities are charged with a host of responsibilities which are routine - provision of ongoing sewage and water services, dispensation of welfare, etc. These decisions are generally made on the basis of pre-set program and policy orientation established by municipal council. They require less in the way of long-range foresight and imaginative planning than do the occasional decisions made which configure the system - e.g., capital decisions. Most of the decisions are made by municipal staff.
3. Difference between municipal staff and politicians.
 - . Politicians. They have overall responsibility for the system. With few exceptions they are heavily influenced by the political concerns which got them elected and which are likely to re-elect them. Because they have a 3 year term, their political lives are usually short, at least in terms of some of the ramifications of solid waste management planning which extend over a 20 year horizon (or more). Generally they want to avoid controversy. Other things equal, their concern is to provide acceptable (read

non-controversial) service on a least cost basis (read: avoid negative political fallout by keeping the tax rate down).

- . Municipal Staff. Staff generally last longer than the politicians. They direct the day-to-day operations and are responsible for putting together the information which the politicians need to make their decisions. The staff is therefore central to the decision-making process. They may be the most important from the point of view of embedding alternatives to landfilling, since they are the ongoing repositories of information and the resident authorities on what should be done in the solid waste area.

4. Concerns which dominate decision making:

- . Political. The "residual" political concern for the municipal politician is taxes. If an issue is (controversial), concerns about the tax rate give way to others. The willingness to depart from the cost minimization approach varies directly with the nature of the controversy, on such things as:

- depth of support or opposition
- constituencies supporting or opposing the issue - area or class affected
- personal attitudes and perspectives of politicians (and the staff who influence them), e.g., if the politician has a deep personal commitment or aversion to the issue.

5. Criteria used in making routine decisions. Normally want to make decisions on the basis of "sound management practice". This

generally means cost minimization based on overall policy set by the politicians.

6. The basic political orientation of minimizing controversy means that the municipality is (risk averse). Wants to minimize risk, because risk, generally means risk of political embarrassment. There are deviations from this, of course. Politicians will champion risky projects if:

- . the project looks to have important political advantages if it succeeds and/or
- . the politician has a strong personal conviction that it should go ahead.

3.1 Nature of the Solid Waste Management Decision Making

General Considerations

Municipalities have the responsibility for solid waste management. The precise nature of the division of responsibilities between the regional municipalities, area municipalities and counties varies. In most cases the regions have disposal responsibility, with the area municipalities having collection and related responsibility.

Municipalities provide:

- . solid waste collection services (area municipality)
- . solid waste disposal services

They provide the collection service on a regular basis. They must have adequate disposal to handle waste within their jurisdiction and mandate.

Consequently there are two kinds of activities which municipalities become involved with in the course of discharging their responsibilities:

- . Day-to-day management issues.
- . Planning decisions involving the overall planning and implementation of the MSW system components for their jurisdiction. These planning decisions come up periodically (e.g., once every 5 to 10 years).
- . Historically municipal decision-making has been dominated by a routine least cost approach. In general, there is no environmental commitment at the municipal level beyond that embodied in meeting provincial regulatory requirements. Maintaining environmental quality is viewed as a provincial, not a municipal, responsibility.
- . It has not been a high profile activity. The budget is not large, at least in comparison with many other activities. On the day-to-day management side, many municipalities have handled cost concerns and regular collection headaches by contracting out solid waste collection to the private sector. This has reinforced the conservative "out-of-sight, out-of-mind" approach.
- . Planning decisions have also been somewhat routine. They have reflected the risk averse, conservative, cost-conscious approach. Landfill is the tried and true method. The decisions have involved how best to acquire landfill and how to accommodate collection and haul systems to landfill location (e.g., transfer, no-transfer) - generally, the least cost location.
- . Over the past 10 years, or so, a number of factors have changed the decision-making environment somewhat, making it more

difficult to rely exclusively on the landfill approach. The fundamental factors:

- the emergence of solid waste as a general public issue - environmentalist pressure, conservator society concerns, etc. This has emphasized the importance of alternatives to landfill.
- decreasing availability of cheap and accessible landfill.
- increased waste quantities to handle, with corresponding filling of already approved sites.
- changing environmental requirements for landfill - a toughening and tightening of landfill environmental performance standards.
- changing regulatory requirements for landfill acquisition: the application of the EA process.
- increasing opposition to siting of landfills.

. What has this meant?

- Increased cost - fewer accessible landfill sites, therefore, longer hauls. For sites which are approved, increased engineering and maintenance requirements.
- Increased controversy - landfills are higher profile than they were. As they compete more and more directly with other land uses, they have to confront the conflicts embodied in these alternative uses. A more environmentally conscious public, skeptical about the Ministry's standards and criteria.

- Changes in municipal planning activities. The EA process means a different operating mode.

Current MSW Decision Making and the Implications for Alternatives

- . The municipality's planning process can be seen to operate in two different ways - routine mode and crisis mode. The municipality is in routine mode when there is no significant controversy over the alternatives.
- . From the perspective of the decision-making process, the choice is made in two basic ways:
 - Overall System Decisions. Involve comprehensive planning of solid waste management system. Almost always initiated by the municipality - based on the perceived requirement to plan for needs of the system. Usually motivated by landfill availability constraints. Master Planning process is aimed at this kind of decision. Done formally, with extensive hearings, documentation, etc.
 - Occasional Decisions. Change in one of system components as a result of perceived opportunity, e.g., put in source separation system as a result of being approached by a firm. Engage in EFW plan, despite no pressing need for landfill. Usually a result of approaches from outside. Many do not involve a special hearing. Council motion or staff decision.
- . Implications for Alternatives:
 - If alternatives are considered in the overall systems decisions, then the economic value of the alternatives

perceived by the municipality is likely to be greater. The fixed component is lower.

- In order for the municipality to give full economic credit to the alternative, it must be in systems planning mode.
- Note: a number of Ministry personnel perceive municipalities to have a double standard when it comes to alternatives to landfill. That is, they state that alternatives have to make money, but landfill does not. Is this true? For example, should source separation have to make money before the municipality is willing to look at it? In the municipality's view it should not cost them any more than landfill. They are reluctant to credit the source separation option with a saving, because that saving is not obvious. It must appear as a line budget item for the municipality to see it. In the Victoria Hospital case, the City was unwilling to acknowledge future capital savings on the landfill, which related to landfill life extension. The exception seems to be St. Catharines on this matter. They are willing to take a longer term view in crediting diversion with the average cost of disposal.*
- If the alternative is implemented (after) the systems decisions are made then it will not be an obvious cost saving to the municipality.
- Sources of information when making decisions:
 - . municipal staff
 - . consultants' reports

*Their contract with Rob Ran pays over \$16 for every tonne diverted from landfill. St. Catharines acknowledges that this is more than their cost saving, but is willing to pay the price.

- . meetings with other local officials, provincial representatives, etc.
- . input from constituents
- . fact-finding trips (on occasion)
- . Solid Waste Decisions - Municipal Criteria
- . Solid waste is usually not a high profile item. It normally does not receive a lot of staff attention. The factors influencing the choice of a waste management alternative include:
 - provincial regulations
 - perceived availability and performance of each waste management approach
 - perceived costs of each management approach
 - staff and politicians' own attitudes
 - local opinion and political pressure
- . Normally they want to make decisions which minimize fuss and controversy. Not driven by environmental concerns primarily (with perhaps a few exceptions) unless perceived in political pressure.
- . In general, driven by desire to make what are perceived to be good management decisions. These will be least cost decisions normally, since keeping taxes down is the underlying concern. Generally, municipalities will do the safe thing - they are not

entrepreneurial, not risk takers. (However, much of this changes if the issue is highly controversial (see below).)

Municipalities

- . Two kinds of solid waste management decisions are perceived to be controversial. Landfill siting decisions and EFW decisions. They are controversial from the point of view of: perceived environmental impacts and the kind of personal impacts associated with any project of this kind (land values, etc.). When the time comes to make these decisions, the municipality is affected by the fact that it is forced to advocate solutions which have negative political fallout.
- . When a decision like this is put forward, the opposition to it which arises, can be seen to centre around two different kinds of issues. The first might be called "planning issues" - is the decision the best one that could be made? Does it in reality serve a need, or does it not? Are there better alternatives available?
- . The second kind of issue might be called "personal impact" issues - one group in the community gains while another loses. At least part of this can be seen in terms of the NIMBY syndrome.
- . The province has processes for making decisions in the face of this kind of controversy. The EA and the EPA are the vehicles which the province has used and is using.
- . The municipal perspective on solid waste management -- other things equal, the municipality will go in the direction of the least cost option. Where there are controversial aspects, the municipality will be generally willing to pay a premium to avoid the political fallout surrounding the controversy. The size of

the premium depends on the perceived magnitude of the controversy.

- . Normal management versus crisis management kinds of decisions. The typical decision-making pattern for many municipalities is to confront controversies when they arise. In this case they go into crisis mode, where decision making becomes an intense affair of political pushes and pulls.
- . If a major controversy can be anticipated, and if there are clear actions which can be taken to avoid the controversies, they will normally be taken. However if the controversy is in the distance (which can be short, given the 3 year term of office of municipal officials) and/or if the remedial action is costly with few perceived political pluses, or perceived to be risky and/or complex, it will not be undertaken.

Source Separation

- . The municipalities do not generally perceive source separation and recycling to be a solution to their solid waste problems. Historically, it has not been perceived to have enough of an impact on the disposal problem to really warrant serious attention.
- . Source separation cannot solve "the crisis" of lack of disposal availability when the municipality is in crisis decision mode. Nor does it have compelling longer term benefits in the non crisis mode. Generally it has been perceived to be "a bother" with little in the way of benefits to offer. Where it has been done, it has often been as a response to perceived local pressure for recycling, or it serves another need (e.g., soaks up surplus staff on certain days). The past experience with these systems - during the 1970's many programs grew up to respond to the environmentalist pressure and the opportunities in the secondary

fibres markets (especially paper) only to collapse with the markets - has provided a negative reference point for many.

- . There are two issues for the province. First issue: what to do in the longer term about this market to make it more stable and reliable -- what market development and diversification initiatives should it take? Second issue for the province -- what to do in the case of a market collapse? Let the source separation systems collapse?* What would be the consequence of another market fiasco?
- . Implications for Provincial Policy
- . What are the levers, and how can they be applied?
- . Levers include:
 - regulatory powers
 - financial incentives
 - public opinion.
- . Preconditions to getting the municipalities to give full economic credit to the alternatives:
 - municipality should be in a system decision making mode
 - municipality perceives that to do so is required to obtain a solution
 - someone else is doing it and it has had positive results
 - staff has far-sighted approach to decision making and has convinced politicians that it is an appropriate course of action.

*The options here include: financial support to cover losses, provincial price support through purchase of the paper, encouragement of a marketing organization established by recycling program operators.

- . Preconditions to get Municipality to pay a premium:
 - in a crisis mode and will pay to help alleviate the problem
 - heavy public pressure
 - highly environmentally conscious staff and/or council with public support.

APPENDIX 4

ENERGY FROM WASTE

APPENDIX 4

ENERGY FROM WASTE

4.1 Technology

A wide range of technologies has been developed which can convert municipal solid waste into usable energy. The proven technologies can be grouped into two categories, by size. For smaller plants (400 TPD and less) three technologies are:

- . Refractory and waterwall controlled air
- . Refractory and waterwall rotary kiln
- . Refractory, moving grate.

All of the above are mass burning units; i.e., they burn as-received.

For larger plants (above 400 TPD) the primary examples of proven technology are:

- . Refractory and waterwall moving grate (mass burning)
- . Suspension burning.

Table E1 lists the technologies with the names of illustrative manufacturers. Table E2 provides examples of these installations.

For smaller plants, in general, the most economic variant is the refractory-controlled air system; for the larger plant, it is moving grate waterwall system.

The number of installations shown in Table E2 indicate that it is a proven technology. While much of the uncertainty concerning the technology's capabilities has been removed, some elements of risk remain.

Table E1

Examples of Alternative Technologies Available

Large Plants (Above 400 TPD)

Moving Grate (Mass Burning) - Von Roll (Signal Revco)

- GKN Birwelco (Martin)

- Volund

- Browning Ferris (VKW)

- Takuma

Suspension Burning

- Foster Wheeler (Occidental/Hooker)

- Babcock Wilcox (SWARU)

- Erie (Sutton)

Small Plants (400 TPD and Below)

Controlled Air

- Petro-Sun/Consumat

- Basic/Trintek

- Vicon/Enercon

- Envirowest

Rotary Kiln

- Westinghouse/O'Connor

- Francis Hankin Industronics

Moving Grate (Mass Burning) - Clark/Keneth

- Morse Boulger

- Detroit Stoker

- Heenan Froude

- Katy/Seeger

- ~~Clean Air~~ Inc.

Table E2

Incinerator Plant List - Alternative Technologies

			<u>Total Capacity</u>	<u>Start-up</u>
Tuscaloosa	Consumat	Refractory CA	300 TPD (4)	2/84
North Little Rock	Consumat	Refractory CA	100 TPD (4)	9/77
Salem, Va.	Consumat	Refractory CA	100 TPD (4)	8/78
Auburn, Maine	Consumat	Refractory CA	200 (4)	4/81
Portsmouth, NH	Consumat	Refractory CA	200 (4)	7/82
Charlottetown, PEI	Consumat	Refractory CA	200 TPD (4)	5/83
Collegeville, Minn.	Basic Eng.	Waterwall CA	65 TPD (1)	11/81
Pittsfield	Vicon/Enercon	Refractory CA	360 TPD (3)	3/81
Gallatin, Tenn.	O'Connor	Rotary waterwall	200 TPD	12/81
Tampa, Fla.	Volund	Rotary, refractory	1000 TPD	Under const.
Commissioner's St., Ont.	Heenan Froude	Refractory, moving grate	900 TPD (3)	1955
Harrisonburg, Va.	Morse Boulger	Refractory, moving grate	100	12/82
Pinellas County	Martin	Moving grate, waterwall	2000 (2)	1/83
Chicago Northwest	Martin	Moving grate, waterwall	1600 (4)	/71
Harrisburg	Martin	Moving grate, waterwall	720 (2)	/73
Saugus	Von Roll	Moving grate, waterwall	1500 (2)	/76
Montreal	Von Roll	Moving grate, waterwall	1200 (4)	1970
Quebec	Von Roll	Moving grate, waterwall	600 (2)	1974

- . The same technologies have good and bad plants; this means that plant availability is not assured. The variation results mainly from errors in details of design and substandard operating practices.
- . Operator capability can heavily influence plant performance.
- . Problem wastes, if not screened out, can result in plant damage (mainly fire related). In the case of suspension burning systems, the risk of explosion damage is a real concern.

4.2 Actors and Decisions

There are two key decisions concerning the EFW facilities for solid waste management, which are relevant for Ontario government policy considerations:

1. A decision to establish an energy from waste facility.
2. A decision to maintain an energy from waste facility, once established.

The second decision, for our purposes, can be considered to be identical with the first. Once an EFW facility is established, its likelihood of continuing is quite high*. The main strategic issue facing the province for solid waste management is not the continuation of already existing EFW plants, but the establishment of new ones.

Two decisions are critical in order for a decision to be made to establish an EFW facility:

*For the plant to meet performing objectives, there must be a commitment to maintain the operating standard after approval.

- The decision to supply waste to the facility:
 - . quantity
 - . price

- The decision to purchase energy from the EFW facility:
 - . quantity
 - . price

Given the nature of EFW facilities, these two decisions are "fixed" in the sense that EFW technology is quite well defined and heavily capital intensive; once established, it remains where it is. The suppliers of waste have to consciously enter into the agreement to supply the waste in advance of the project going ahead.* Similarly, the energy user is almost always a dedicated one: either a steam or electricity single user or a multiplicity of users serviced by a grid. In the latter case, it is the party controlling the grid that makes the decision concerning the purchaser of the energy. Long term contracts are essential for both.

The following actors are involved in deciding whether or not these projects go ahead:

- . Project proponent

- . Municipal government
 - . area municipality
 - . regional municipality

- . Energy user

*This is in contrast to source separation where the householder's participation is not guaranteed in advance. Source separation projects generally base economic projections on assumed participation levels from householders. Participation levels are not contractually assured but can be influenced by education and by statutory requirements - by-laws, for example.

- . Government approval agencies

A. Project Proponent

In Europe EFW project proponents are generally municipalities; they are both the supplier of waste and the energy consumer since many of the municipalities operate district heating systems. In the United States project proponents have been energy users, municipalities, energy service companies and a mixture of the three in consortia or joint partnerships.

In Prince Edward Island the proponent is the province; in London it is the energy user (Victoria Hospital).

In cases where the proponent is the energy user or a third party (an energy service company, for example), the decision criterion centres on economics. There are two major components to this:

- . Economic attractiveness. Expressed in terms of rate of return -- that is, the amount by which economic benefits are required to exceed costs -- that return must be higher than the "hurdle" rate of return established by the proponent. That hurdle rate depends upon:
 - . Risk perception: The higher the perceived risk of the project, the higher the return required for equity invested.
 - . Return on alternative investment opportunities available. The greater other opportunities are available, the higher will be the return required for EFW projects. For example, private sector proponents are likely to have a higher return requirement than those for the public sector, because they generally have a broader range of economic alternatives for investment available.

- . Perceived bargaining position. The stronger the proponent perceives his or her position to be relative to other actors (including funding agencies) the higher will be the premium above the "true" rate of return required by the actor.
- . Perceived role of the investment. Return on investment literature suggests that companies in the private sector often require different rates of return for different kinds of investments. Those investments which are considered to be "strategic" for business purposes generally require lower rates of return than those which are non-strategic. For example, a company in the manufacturing business will normally require a higher rate of return on an energy from waste project than would a company in the energy from waste business.
- . Financeable. The proponent must be able to procure a source of funds to cover the project debt at a price which permits the required rate of return. Usually this means that primary and secondary guarantees for the project debt must be obtained -- someone to backstop the loan if the vendor and/or energy customer are insolvent.

There are other factors which affect the ones discussed above:

- . Expertise in the area and understanding of the equipment, its performance and capabilities. Usually this means that the proponent will take on the performance-related risks.
- . Acceptable to the image. The proponent must feel comfortable with being associated with municipal solid waste incineration.

How is this likely to differ among various proponent types?

Private-Sector

Private sector proponents will generally require a rate of return higher than those in the public sector. Frequently a figure of 15% return on total capital is used for an EFW project. This figure may be high or low depending upon some of the factors mentioned above. For example, one would expect that a company not as familiar with EFW and not in the EFW business would require a higher rate of return due to risk perception (than companies directly involved in the business). However, it may be that energy service companies, or equipment vendors acting as proponents, will require just as high (if not higher) a rate of return because of their perceived bargaining position.

A 15% rate of return has been used in the economic assessment, with the impact of variations in this rate of return requirement examined in sensitivity analyses.

Public Sector

Public sector proponents, such as energy users in the institutional sector, will generally require a lower rate of return on equity than private sector proponents. Their financing requirements also may be easier to satisfy.

They are likely to require a lower rate of return, because they have fewer alternative investments available. At the same time, however, without an explicit government policy favouring such EFW investments, they are likely to be more risk averse. Consequently, as long as EFW is perceived to be risky, public sector proponents may be reluctant to undertake projects.

Usually, these institutions have little equity to put up; consequently, they must obtain capital financing which covers all, or almost all, of

the debt requirements. On the other hand, they are often able to gain access to such financing more easily than some private sector proponents. For example, London's Victoria Hospital, has been able to secure 100% financing for the balance of its debt requirements (after grants). The long-term stability of such institutions is an important factor in this regard.

Municipality

Municipalities are similar to other public sector institutions in that they tend to be more risk averse and require large debt financing. Their access to debt is generally by the floating of debentures.

As for other public sector institutions, the economic assessment assumes that pay-back requirements will be the same as the financibility of these projects: assumed to be a positive cash flow with repayment of all short-term debt by the 5th year of project life.

B. Energy User

Energy users fall into two categories:

- . Those for whom there is no barrier to participating in EFW projects except economic attractiveness;
- . Those who are not interested in participating in EFW because they do not consider participation in the project consistent with other objectives (maintaining image, community profile, etc.)

How much will the energy user be willing to pay for energy from the EFW project? There are 3 factors influencing this:

- . Cost of alternative energy -- how much will the proponent have to pay for energy? Will there be just fossil fuel

savings or will there be other operating and/or capital savings?

- . Cost of participating in the project. Will there be losses to company image? Changes to operating procedures for plants requiring allocation of company resources? The higher the cost, the lower is the price which the user is willing to pay for the energy from the EFW project.
- . Savings premium required: how much will the energy user require as an incentive to participate in the project? What level of savings will the user demand? This will depend upon:
 - Risk perception: the higher the perceived risk of the project, the higher the economic incentive required to participate in the project.
 - Perceived and non-economic benefits. If the user is convinced that participation in EFW will enhance the user's image, or is part of perceived "responsibility", then the premium required will be lower (even negative).
 - Perceived bargaining position. The stronger the user perceives its position to be relative to other actors (including funding agencies), the higher will be the premium demanded for participating in the EFW project.

Going on experience from previous projects, we have assumed 15% paid to energy users in the base case.

C. Municipality

The municipality must provide refuse to the project. As indicated in the discussion of the municipal actor and role in the solid waste

management process, the municipality's willingness to participate in the project depends upon its perceived political acceptability and the non-political benefits which the municipality perceives to be forthcoming from the project. Similar factors influence the willingness of the municipality to pay for the project's taking its solid waste.

- . Assurance that alternative is politically acceptable
 - Significant (and active) support exists for EFW and/or:
- . Community opposition to EFW not critical
 - EFW considered objectively safe: political representatives convinced that there is no "good" reason to be opposed to the project
 - Major groups without NIMBY incentive do not seriously oppose EFW
 - Opposition not generalized; opposition not influential with groups having decisive political clout within the community.
- . Adequate economic incentive: Project must require no more than municipality is willing to pay for alternatives. Willingness to pay depends upon:
 - Perceived avoided cost associated with going to landfill alternatives
 - Perceived strength of consensus that premium should be paid to encourage landfill alternative in general and EFW in particular. This depends upon:

- . strength of opposition to landfill/difficulty of obtaining approval
- . extent of perception of responsibility to "do something with wastes other than landfill them"
- . perceived desirability or undesirability of EFW; strength of that perception in key political constituencies
- . attitude of politicians and staff (independent of impact of public opinion)
- . perceived bargaining position with proponents

D. Government Approval Agencies

As indicated above, the Environmental Assessment Board is involved in granting approvals to projects which have municipal proponents.

To date only one EFW project has gone through the Environmental Assessment process. In London, Victoria Hospital's project was approved by the Joint Board after an Environmental Assessment Hearing.

In that decision, the Board was convinced that the project was acceptable on the basis of:

- . Need. The Board agreed that the project would bring economic benefits to the Hospital and that it was generally economically beneficial to the community.
- . Environmental performance. The Board was convinced that the facility would meet the Ministry's standards for air emissions and its provisional guideline for dioxin.

The Decision to Provide Assistance/Incentives to EFW Project

The Provincial Government through the Ministries of Energy and Environment has provided assistance to energy from waste projects in the province in the past.

The Ministry of Energy has funded up to 50% of the feasibility study cost for energy from waste projects which qualify under its programs. The Ministry of the Environment has provided technical support and in the case of Victoria Hospital has funded monitoring costs for the start-up and the first two years of the plant's operation. The Ministry of Energy has also provided grant money to Victoria Hospital and has indicated that funding for these projects will be available on an "as needed" basis.

Money has been made available through BILD on a project specific basis as a loan to the Victoria Hospital project.

Federal Government

The Department of Energy, Mines and Resources has provided assistance to EFW projects by its FIRE program. It funds up to 20% of eligible capital costs (generally about 85%).

The Federal government tax policies have favoured EFW projects in that Class 34 permits a fast write-off (25%, 50%, 25% straight-line) for eligible components of energy from waste plants.

NITEP

Environment Canada began the National Incinerator Testing and Evaluation Program in 1984. This program grew out of the concern about municipal incinerators as a source of emissions of concern. This had been identified in the Ministries of Health and Welfare and Environment Canada's Advisory Committee on Dioxins report. This report found that municipal refuse

incineration was the number one controllable source of dioxin emissions into the atmosphere.

The NITEP objectives include the:

- . identification of appropriate testing methodologies
- . the testing of the three most common types of municipal incinerators - controlled air (PEI), moving grate (Quebec City), and suspension burning (SWARU).
- . the identification of plant design and operating conditions which will minimize dioxin production.

The program is expected to make its final report by the end of 1987. The first plant test report for PEI has been released. Quebec is being upgraded for testing in 1986. SWARU is scheduled to follow the Quebec program.

The EFW Industry

A number of firms have been active in attempting to develop energy from waste opportunities in Ontario. These firms are in the business of constructing and/or operating EFW facilities. They include engineering firms, equipment vendors, and firms active in operating waste incinerators. They include firms such as Enercan, Fenco, Petro-Sun and Trintek.

Sometimes these firms are a consortia including equipment manufacturers, and engineering firms.

These firms have played an important role in popularizing energy from waste and developing the business in Ontario. They provide a "packaging" service combining engineering expertise, project management and knowledge of the equipment. They can also provide operating experience. They can take on an important part of the risk -- for example, the job of ensuring that construction cost comes in at its bid price and that operating performance

experience. They can take on an important part of the risk -- for example, the job of ensuring that construction cost comes in at its bid price and that operating performance during the initial years of the project's life are acceptable. In some cases, the firms also provide financing for the project. For example, Petro-Sun/SNC have offered financing as one of the key parts of their service. Enercan and others have also been involved with putting together financing packages for clients in other jurisdictions.

Public Interest Groups

Pollution Probe has taken a position on energy from waste which is that the information available to date on incinerator emissions indicates that this is an area of potential concern. Incinerator testing has revealed a wide range of performance on key emission components. They have suggested that the emissions are sufficiently wide-ranging, that there should be a moratorium on new EFW facilities pending further testing of the equipment.

- . They did not intervene in the Environmental Assessment concerning Victoria Hospital; however, given their current position, they can be expected to take part in future EA Hearings concerning these facilities.

Interested/Affected Public in the Area of the Plant

Those directly affected by the plant's operation have played an important part in the past. In London, the Citizens' Coalition, which was comprised of residents directly affected by the plant and those in the community concerned about the impact of the project on London's local environment, provided the primary opposition to the plant at the Environmental Assessment hearing. A similar group has formed to intervene into Toronto's Environmental Assessment. There are two kinds of concerns expressed by these groups:

- . Those concerns which are similar to those raised around the installation and operation of any industrial operation of this general type -- that is, concern with emissions, noise and increased congestion. The primary concern is with the impact on the living environment and concomitant impact on property values.
- . Concerns associated with specific characteristics of EFW plants:
 - The first concern is the fact that it is municipal refuse which is being used as a fuel -- odours and the stigma associated with this kind of material.
 - The second concern involves dioxin emissions which are associated with the incineration of municipal refuse. The perception of dioxin that it is of extreme concern because it has been identified as a highly toxic substance with carcinogenic properties. The source of the concern is the direct linking of MSW with dioxins (various tests at municipal incinerators including that of Commissioners Street in Toronto and SWARU in Hamilton). There has been considerable coverage of this issue in the press.

This concern has built significantly since 1983, the time of the Victoria Hospital Environmental Assessment. It has provided a key focus for concern during the consideration of EFW plants for Halton and Peel; it appears to be the primary issue for the concern of Toronto's opposition.

Success Factors

Victoria Hospital provides a practical example of how the process of approving an EFW project can proceed successfully in Ontario.

4.3 Victoria Hospital -- Example of a Successful EFW Project

Background to the Decision

- . London Victoria Hospital (LVH) decided to undertake a pre-feasibility study of an energy from waste facility. The Hospital was in the process of planning an expansion; the possibility of including an energy from waste facility had been suggested by The ECE Group who had some experience with energy from waste. Positive results of this study and the availability of feasibility grant support money from the Ontario government encouraged the Hospital to proceed to do a more detailed feasibility analysis.
- . A steering committee for the study was struck with a study funding agreement involving the Hospital, City of London, Ministry of the Environment, the Ministry of Energy and the Ministry of Health. The City of London agreed to participate on the condition that half of the transportation savings associated with the facility would flow to the City.
- . Technical and economic evaluation took place evaluating a variety of options -- different sizes, plants with and without co-generation and including and excluding sludge. The sludge variant was included at the request of the City of London. The City was faced with the necessity of modernizing its Greenway Pollution Control Centre.
- . The feasibility study concluded that the proposed plant was technically feasible and economically viable, based on:
 - Energy and inflation projections made by the Ministry of Energy at that time.
 - Projections of grant availability from government.

- . The strong economics of the project were due to:
 - Good load characteristics
 - High project price for energy
 - Relatively low rate of return required by proponent (lack of alternative economic opportunities; an implicit willingness to assume a share of the project risk)
 - A combination of energy customer and owner-operator.
- . The preferred plant configuration was a 250 to 300 ton per day municipal solid waste plant together with a 220 TPD sludge incinerator. Co-generation was included.
- . A major issue concerning the future of the project concerned financing of the debt requirement; a significant portion of the facility's in-service cost would have to be raised by debt financing. Options explored included:
 - . Debt financing by the Hospital, debt financing by the City via a debenture issue, provincial loan guarantee to backstop the Hospital's financing, infinite third-party financing. The Hospital decided that the plant should be owned and operated by itself; it wanted to ensure that it had control over its own source of steam and supplementary electricity.
- . On the advice of the Steering Committee, an independent source of financing was approached.

The Decision

- . The Hospital decided to pursue the plant actively. Its motivation was essentially economic -- it saw the plant as helping it fund its expansion and providing a source of revenue for the Hospital during a period of increasing funding restraint. The Hospital had few alternative "money-making" projects competing for its attention. The City of London agreed to go along with the plant.
- . For the City, the project had two potential benefits. The City would save on its solid waste management costs and it would avoid the trouble associated with constructing and operating the new sludge facility (GPCC had been a source of irritation to the City).
- . The project was presented to City Council and to a series of public meetings in the spring and fall of 1981. A variety of concerns were raised about the project, primarily concerning the environmental impact of the facility.
- . It was decided to designate the project under the Environmental Assessment Act voluntarily. In part, this decision was made in order to deal with public concerns that had been raised about the environmental performance of the plant.
- . The decision was made to include EPA approval as part of the Environmental Assessment process. The proponent believed that this would help to decrease the amount of time required for complete approvals.

Environmental Assessment

- . The Environmental Assessment evaluation began in early 1982. It was presented to the Ministry in the summer of 1982. It included

a full range of technical, economic and social impact assessments of a wide range of options including a "remote siting" and an "all electric" option which had been included as a result of discussions with the opposition.

- . Hearings began under the Consolidated Hearings Act in February 1983, following time for the preparation of the opposition's argument. The process took over 4 months with more than 50 days of hearings. The cost to Victoria Hospital (borne by the Ontario Ministry of Energy) was about \$1.2 million. (Note: When the cost of the feasibility studies are added, the total comes to about \$1.5 million.)
- . The Citizens' Coalition, a local group of residents, provided the major opposition to the project. Its concerns were primarily the health and environmental impacts of the plant. Principal worries were the incorporation of sludge incineration at the facility and the emission of dioxins by the plant.
- . Expert evidence was heard and cross-examined on a full range of impacts of the plant on the environment. The Ministry of Environment's provisional guideline on dioxins, which had been prepared prior to the beginning of the Hearing phase, was presented. Dr. Harding who had been primarily responsible for the background work to the development of the guideline testified.
- . Prior to and during the Hearings phase, several relatively minor changes were made to the facility design and operation, in part to address concerns about the plant's operation. For example, the decision to raise the proposed stack height was made before the hearings in response to the Ministry's release of its provisional guideline for dioxin. This improved emission dispersion beyond that required by the Ministry's emission standards and the provisional guideline for dioxin. The staffing of the plant was increased. Hearings ended in early June 1983.

- . The Joint Board approved the proposed alternative, including sludge incineration, informally in August 1983. The formal decision was handed down in October. The appeal period ended in December 1983 with no appeal having been registered.

The Tendering Process

- . With the Environmental Assessment complete, government funding could be confirmed. The federal government's review was completed in May of 1984; provincial funding was committed by June 1984.
- . Specifications were developed for preselection of major equipment and of a construction management firm. The first tendering process ended in January 1985. The bids were considered in depth. The price quoted for the sludge incinerator related work was significantly higher than the estimates made by the feasibility studies and the EA documentation. The sludge component was uneconomic for the Hospital.
- . In keeping with the terms of its Agreement with the City, the Hospital informed the City that it could not proceed with the sludge portion of the project. By the terms of the Agreement, the City could choose to proceed with the project (sludge only) or turn the project down.
- . The City of London Council's response was to request a staff review of the economics of the project to ascertain as to whether it remained economically attractive for the City.
- . There was considerable discussion at City Council and in the press concerning this issue. The Citizens' Coalition presented a brief to the Council stating that the Council should turn the project down for environmental reasons.

- . The Coalition argued that since the completion of the Environmental Assessment process, new information had come to light, including that contained in the federal government's Expert Committee on Dioxins.
- . The City staff's economic review of the project concluded that the project was beneficial for the City -- while the project promised a lower economic return than it did with sludge included, the project would save money and would also assist the City's solid waste management efforts by prolonging landfill life. The City Administrator's report recommended acceptance of the project.
- . City Council, after a considerable debate, decided to accept the project by a vote of 8 to 7.
- . Victoria Hospital has finalized a financing package and has signed a letter of intent with a Fenco to construct the facility.
- . Authorization to procure equipment was given to Fenco. Equipment is being retendered by Fenco and award of incinerator supply and installation will be made by the end of November.

IMPLICATIONS OF THE VICTORIA HOSPITAL EXPERIENCE

- . EFW projects can be approved, financed and implemented in Ontario under present arrangements:
 - Approval mechanisms
 - Government financial support

- . The key to success was the proponent's desire and ability to see the project through. The proponent who was the owner-operator and the energy consumer was committed to the project. The proponent was willing to allow the Environmental Assessment process to decide the issue in the face of considerable local opposition to the project. The primary factor underlying the proponent's commitment was the economic incentive.

- . Siting and the dioxin issue may become increasingly important and more difficult to deal with. One interpretation of City Council's vote is that it was a clear indication that concern about dioxins is at a much higher level than at any time during the past. A large number of City Council members were unwilling to allow the previous Board decision to determine the fate of the project. It suggests a concern about the Ministry's provisional guideline for dioxins. It also may mean that the Environmental Assessment process per se provides less assurance to municipal officials who generally feel that environmental matters are beyond their competence and should be determined elsewhere. It should be pointed out that London has recently had other negative environmental experiences (the problems with Pottersburg Creek, for example) which may make it an atypical example. Recent NITEP results at PEI have demonstrated relatively low dioxin levels (compared to those assumed for Victoria Hospital) which may strengthen the EFW proponents' case in addressing the dioxin issue.

- . The question of ash from EFW facilities may have to be dealt with more fully in the future. The environmental impact of ash from the EFW facility was discussed at the hearings but did not play a major role. Experience in the U.S., where fly ash is categorized as hazardous, (it is not so characterized in Ontario) suggests that it may figure more prominently in the future.

- . The importance of landfill requirements. The City of London was not engaged in the process of attempting to acquire a new landfill while the EFW plant was being constructed.
Consequently, the EFW project was seen somewhat distinct from the solid waste management "problem". While the savings of landfill were cited as a benefit, they were not the driving political concern to the City at that time. As a result, the economic concerns predominated and the City needed an economic incentive to participate. The City Council discussion on the EFW project reflected this -- there was no great perceived pressure to site a new landfill. The process had not started; consequently, the trade-offs between landfill life extension and EFW were not at the forefront of the Council's mind.
- . Peel's approach to its energy from waste plant is interesting in this regard. Peel has decided to require of its facility environmental performance which exceeds the standards and guideline set by the Ministry of the Environment. It has decided upon requiring a technological performance which is similar to that of Victoria Hospital and which will deliver environmental performance at about the same quality. Peel has also suggested in its draft agreement with Petro-Sun that it (Peel) has the right to have the facility shut down should established standards be exceeded. There seems to be three reasons for this approach:
 - the precedent of environmental performance set by the Victoria Hospital facility
 - the desire to apply best available technology to deal with risk areas of concern where limited data is available - e.g., dioxin and heavy metals. This may be reinforced by the apparent lack of credibility of the standards and guidelines set by the Ministry of the Environment
 - concern about the Ministry's enforcement capability.

The following two sections take up two critical issues of concern for strategic options formulation -- dioxin emissions and project economics.

4.4 Dioxins and EFW Plant Sitings: Some Considerations

There are two major questions concerning dioxin emissions.

1. What level of dioxins do EFW plants emit?
2. What level of dioxin emissions are acceptable?

1. Levels of Emissions from EFW Plants

This concern was the focus of the Pollution Probe report and was also directly dealt with by the Federal government's Task Force. The Probe report concluded that the level of emissions at these plants, including dioxins, were sufficiently variable that more information was required before giving the technology a clean bill of health. Pollution Probe has taken the position that no further plants should be approved pending a clarification of plant performance. The concern is one of the relationship between waste composition, plant design and configuration, plant operating conditions and the production of dioxins and other problematic emissions.

These concerns have been heightened in the public's mind as a result of such events as the first test program at SWARU (which yielded highly variable readings, some of which were significantly above the Ministry's provisional guideline on dioxins).

For Victoria Hospital it was argued that the plant's emission controls and stack height would combine to yield dioxin concentrations significantly below the Ministry's provisional

guideline.* However, concern that emissions which are predicted to occur and those that actually are generated, resulted in the agreement for a dioxin test during the plant's initial operating period.

Strategic Considerations

How should this issue be addressed by the Ontario government? Is it being adequately dealt with by existing efforts?

The first issue is the credibility of the NITEP program and the proposed tests. There has been no major criticism of NITEP's approach to date, nor any suggestion that the results will be biased. Nor has there been any major concern expressed that the Ministry is not a credible source of testing information -- the way it conducted the SWARU tests and its proposal for the Victoria Hospital tests, for example, have not provided a major focus for criticism.**

There are concerns on two fronts, however. The first relates to the variability of the waste stream and plant operating conditions, and the resulting emissions. It is suggested that until more is known about these relationships, tests such as those undertaken by NITEP will be useful, but limited in their applicability to other locations and conditions. The second concern is on the issue of enforcement. Will the Ministry actually require plants, once installed, to "clean up their act" if they do not perform up to the requirements of the guideline? The Ministry's reputation on this matter is central.

*Even with the conservative assumptions made about stack emissions. Due to a lack of information and the level of concern expressed, a higher level of dioxin stack emissions was assumed. Subsequent NITEP results from PEI are 1/17 of that level.

**Of course, this could emerge as a major issue in the future.

A longer term program of testing and research, in conjunction with NITEP, could address this issue. Such a program could be directed to a university or research institute, creating a "centre of excellence" on solid waste incineration. It could also deal with issues concerning incinerator ash.

The matter of enforcement is one that goes beyond the dioxin issue -- it is the Ministry's overall credibility for its enforcement of environmental regulations generally. It is interesting to note Peel's response to the issue of plant non-performance. They have requested the right to require the shut down of the EFW facilities as a negotiating point in their dealings with Petro-Sun.

Much of the public's attention has been focussed on issues of emissions and enforcement. However, it should be remembered that EFW plants are new facilities. New facilities are projected to be able to perform well within Ministry guidelines. The key issue then is: what are acceptable levels of emissions? This matter has not been given the same attention in public debates to date; however, it underlies all the concerns and could emerge as the primary point of contention.

2. What levels of dioxin are acceptable?

The Ministry of the Environment developed and issued a provisional guideline for dioxins in the period leading up to the Victoria Hospital Environmental Assessment. This provisional guideline was based on the work of Dr. Harding and others at the Ministry of Labour.

As mentioned above, Victoria Hospital was estimated to be able to perform considerably below this guideline.*

*Assuming much higher stack concentration than found by the NITEP PEI test.

Dr. Harding testified and was cross-examined at the Victoria Hospital Environmental Assessment concerning the establishment of the guideline. There was no intervention by public interest groups from outside London on this matter. Dr. Harding also testified and was cross-examined at the PCB Commission Hearings. The PCB Commission requested a report be prepared by an independent consultant which suggested that a lower figure could be more appropriate than that indicated by Dr. Harding's guideline. However, the Commission appears to have concluded that the provisional guideline was acceptable and should be established as a standard. The Ministry's general approach to guidelines -- the establishment of an ambient standard rather than one which deals with plant emissions directly -- provided much focus for discussion at the Commission. There was concern about the appropriateness of such approach for dioxins, given concerns about accumulation, synergistic effects, etc. This aspect of the Ministry's regulatory approach was discussed by the Commission; the Commission made recommendations on this.

Do the results of these two hearings resolve the matter of the proper level for the guideline?

Guideline and standard setting is a complex process; it involves a consideration of threshold versus non-threshold effects, the extrapolation of results from animal studies to human populations; issues of what an acceptable level of risk is, given the projected health effects. It is an issue that is difficult for the public, even the informed public, to grasp and to understand.

In the face of this, will the public continue to express concerns and will opposition continue to form around the dioxin question? If so, what will the significance of its opposition be? For example, will municipal councils be reluctant to support EFW projects because of public concerns about dioxins?

Strategy Considerations

1. The two Boards making decisions on these matters have agreed with the Ministry's guideline (although the PCB Hearings decision indicated some concern about the overall approach of using an ambient standard rather than an emission standard, the Commission did appear to agree with Harding's approach to risk and the numbers that resulted from it). It appears that plants performing within the Ministry guidelines will be able to obtain approval -- through the Consolidated Hearings Board, the Environmental Assessment Board, etc. Unless future Boards reverse their position on this, the dioxin emission issue is not likely to derail a project which gets as far as seeking Board approval.
2. The major issue is, therefore: will concern around dioxins prevent EFW projects from occurring by convincing key decision-makers not to bring the proposals forward to the approvals stage? Will the Halton experience be the norm? The two key actors which can be potentially affected by this are the energy user/proponent and the municipality.

Given the Victoria Hospital experience, it is important to consider the municipal actor in this regard. Will municipal officials be convinced by constituent concerns around dioxins? This is a matter of:

- . The strength of dioxins' concerns -- how widespread are they concerning the EFW plants being proposed?
- . The credibility of this concern to the municipal official -- does the municipal official regard the concern as being: hysterical, uninformed, a surrogate for NIMBY, or legitimate?

The key then is the credibility of the Ministry's guideline and whatever standard it chooses to set. It has credibility with the Approvals Boards but it has yet to evoke similar credibility with the public and with municipal officials not involved in the hearings process. How can the Ministry establish its credibility in this regard? There is no easy answer to this. It is evident that information about the Ministry's approach to regulation and the approach for establishing whatever standard is finally decided upon are particularly critical.

- . It is clear that the affected public does not understand the Ministry's approach to regulation in general, and the dioxin guideline in particular.
- . It is also clear that there is some disagreement about what an acceptable standard should be; some in the scientific community, some public interest groups and others have suggested a different value for the guideline, and/or a different type of guideline. Some believe that a "best available technology" approach should be taken with Victoria Hospital, or a higher level of performance, establishing the de facto standard.
- . One option is to produce literature and/or audio-visual material which explains the Ministry of Environment's regulatory philosophy which shows how the dioxin guideline was established and how it fits into its overall approach.
- . Another option would open up the guidelines for full discussion, inviting submissions from key constituencies including public interest groups, environmental experts, etc. -- perhaps before or during the process of establishing the provisional guideline as a standard. This could be an important step. It would allow for disagreements to be raised in public and the full presentation of the Ministry's evidence

in the context of establishing a standard. This would have the advantage of opening the issue up in a public manner. It could also assist in preparing a "layman's" explanation of the Ministry's regulatory approach which could be used in developing the material described in the previous option.

Remote siting may be the only "final" way to deal with the dioxin issue in the meantime, or in the future. That is, these plants should be sited only in those jurisdictions where the community opposition is likely to be low. The problem with this approach, of course, is that economics are frequently much less attractive -- a truly remote site will tend to be significantly less economic:

- . the cost of transportation of the waste is likely to be high
- . the energy-related benefits are likely to be low -- if, for example, the "remote" electricity generation variant is selected.

4.5 EFW ECONOMICS

There are five elements to determining project economic attractiveness:

1. Project revenues
2. Project capital cost
3. Project operating cost
4. Taxes
5. Economic return criterion of proponent.

1. Project Revenues

Energy-related revenue and tipping fees constitute two sources of revenue for these projects.

1.1 Energy Revenue

- . Energy produced
 - Total waste processed
 - BTU content of wastes
 - Equipment efficiency
- . Energy used
 - Total energy demand
 - Utilization factor: shape of energy demand -- a "flatter" demand will permit a more complete utilization of the energy utilized -- e.g., 24 hours per day for a 7 day week
 - Proximity of customer to plant: distance decreases effective energy use. Note: plant sizing involves an economic matching of plant production to energy utilization.
- . Price of energy utilized
 - Depends on energy type replaced and discount required by the proponent.

1.2 Tipping Fee Revenue

- . Depends on municipal willingness to pay (see section on the Municipal Actor)

2.0 Project Capital Costs

- . Equipment -- incinerator and building
- . Engineering and project management
- . Site-related -- site preparation, cost of land
- . Pollution control
- . Approvals
- . Interest during construction.

3. Project Operating Costs

- . Labour
- . Maintenance
- . Supplementary Natural Gas
- . Electrical
- . Pollution control
- . Pollution monitoring
- . Residue disposal
- . Other

4. Taxes

- . Depreciation allowance on capital equipment
- . Investment tax credit
- . Taxes on income
- . Municipal

5. Return Criterion

The profitability required by the proponent determines how much project revenues have to exceed project costs. This is determined by:

- . type of proponent (private, public sector)
- . risk perception
- . alternative economic opportunities available.

The section on "government grant requirements" below, discusses the economic performance criteria assumed to apply to private and public sector proponents.

Tables E3 through E5 present representative cost and efficiency utilization data for small, medium and large plant sizes. These are

derived from the most recent information available on plants relevant to the Ontario setting. They are "steam only" plants.

It should be emphasized that the costs can vary significantly from application to application and that the data is presented for illustrative purposes only. The model prepared for the Ministry is designed to permit entry of a wide range of different assumptions concerning key variables. It can be used for project specific analyses.

A computer model was constructed to evaluate the economic performance of EFW to a prospective proponent. It analyses the project from the perspective of different proponent types -- private sector (different tax positions) and public sector -- calculating present value and rate of return. It has been set up to analyse the impact of varying key "strategic variables". It automatically calculates project performance for a range of tipping fees, and estimates the amount of up-front government grant required to make the project economically attractive, given the return criterion specified by the user. The results of a selection of analyses undertaken with this model are presented below.

Table E3

EFW : Small Scale (Base Case)

<u>Variable</u>	<u>Assumptions</u>
1. Project Size	Small: 100 TPD
2. Steam vs. Electricity	Steam
3. Nature of Waste Stream	Municipal, 4500 BTU/LB
4. Technical Performance (Steam/Refuse)	Steam/Refuse: 2.4:1
5. Energy Prices and Price Increases	Natural Gas at 4.40/Mcf. No Real Increase.
6. Government Incentives	None
7. Capital Cost Basic Plant	9 million
8. Pollution Control	Comparable to Victoria Hospital
9. Approvals Costs	Victoria Hospital; Lowered to Reflect Scale
10. Operating Costs	\$28/ton
11. Lifetime of Plant	20 Years
12. Financing	Private Sector: 25% Equity 75% Long Term Debt
13. Energy Discount to User	15%
14. Tipping Fees	Range
15. Plant In-Service Cost	Capital Cost plus: - 10% Engineering and Project Management - Approvals Cost - Interest During Construction

Table E4

EFW : Medium Scale

<u>Variable</u>	<u>Assumptions</u>
1. Project Size	Medium: 300 TPD
2. Steam vs. Electricity	Steam
3. Nature of Waste Stream	Municipal, 4500 BTU/LB
4. Technical Performance (Steam/Refuse)	Steam/Refuse: 2.4:1
5. Energy Prices and Price Increases	Natural Gas at 4.40/Mcf. No Real Increase.
6. Government Incentives	None
7. Capital Cost Basic Plant	22 million
8. Pollution Control	Victoria Hospital equivalent; included in Capital Cost
9. Approvals Costs	Victoria Hospital; \$1.5 million
10. Operating Costs	\$24/ton
11. Lifetime of Plant	20 Years
12. Financing	Private Sector: 25% Equity 75% Long Term Debt
13. Energy Discount to User	15%
14. Tipping Fees	Range
15. Plant In-Service Cost	Capital Cost plus: - 10% Engineering and Project Management - Approvals Cost - Interest During Construction

Table E5

EFW : Large Scale

<u>Variable</u>	<u>Assumptions</u>
1. Project Size	Large: 1400 TPD
2. Steam vs. Electricity	Steam
3. Nature of Waste Stream	Municipal, 4500 BTU/LB
4. Technical Performance (Steam/Refuse)	Steam/Refuse: 2.6:1
5. Energy Prices and Price Increases	Natural Gas at 4.40/Mcf. No Real Increase.
6. Government Incentives	None
7. Capital Cost Basic Plant	115 million
8. Pollution Control	Electrostatic Precipitation or Baghouse*
9. Approvals Costs	Assume twice Victoria Hospital costs, to reflect some scale effects**
10. Operating Costs	\$22/ton
11. Lifetime of Plant	20 Years
12. Financing	Private Sector: 25% Equity 75% Long Term Debt
13. Energy Discount to User	15%
14. Tipping Fees	Range
15. Plan In-Service Cost	Capital Cost plus: - 10% Engineering and Project Management - Approvals Cost - Interest During Construction

*Based on City of Toronto proposal which may not be current now.

**In reality approvals costs may decrease due to learning effect from Victoria Hospital.

A base case rate of return on total capital is calculated for different tipping fee levels for each of the three plant sizes. It is presented as Table E6. Assumed inflation over the plant's lifetime is 4% with a 0% real increase for energy prices. The results show that a medium-sized plant would require a tipping fee of about \$40/tonne to attain a pre-tax rate of return of 15% on total project in-service cost.

Future Economic Performance

How are these projects likely to perform in the future? Will plants constructed in 1990 and beyond have better economics than those constructed in 1985?

There are no clear indications that capital and operating costs will change significantly in real terms. It appears that the technology is "mature" in this respect.

Projected increases in energy prices led previous strategic assessments of EFW for Ontario (eg. Price Waterhouse) to project an increasingly attractive future for EFW in the province. The general view of energy price increases has changed dramatically since then. There is now no consensus that real price increases will materialize in the short to medium future. The assumption of 0% real energy price increases, which is used in the economic analysis, is higher than many current energy price forecasts, especially for the next 5 to 10 years.

Table E6

Rates of Return for Different Sizes of Plant*

Tipping Fee (\$/Tonne)	Plant Scale		
	Small	Medium	Large
20	1.3%	6.1%	7.5%
22	2.4%	7.2%	8.4%
24	3.5%	8.2%	9.3%
26	4.4%	9.2%	10.2%
28	5.3%	10.1%	11.0%
30	6.2%	11.0%	11.8%
32	7.0%	11.9%	12.6%
34	7.8%	12.7%	13.4%
36	8.6%	13.5%	14.1%
38	9.4%	14.3%	14.8%
40	10.1%	15.1%	15.6%
42	10.8%	15.9%	16.3%
44	11.5%	16.7%	17.0%
46	12.2%	17.4%	17.7%
48	12.8%	18.2%	18.4%
50	13.5%	18.9%	19.1%

*Return on In-Service Cost

Sensitivity to Strategically Relevant Variables

Economic attractiveness is the precondition for these projects to go ahead. Government initiative can directly affect this economic attractiveness through grants, tax incentives, and so on. There are a number of ways in which government can encourage projects which require less economic assistance.

Elements which can be directly influenced by government initiative and/or can be affected through project selection have been analysed as below, in a preliminary fashion.

- . Project size: Three sizes have been selected for analysis -- small, medium and large. See Figure EF1. The results show economies of scale between small and medium-sized plants. However, the performance of medium and large scale plants is much closer. This latter result may be unrepresentative due to the limited data on large scale plant costs in the Ontario setting.
- . BTU content of waste: Municipal waste is typically estimated at about 4500 BTUs per pound. Source separation programs which reduce only the paper fraction of the waste may reduce this to about 4000 BTUs per pound at present recovery levels. Industrial waste with high quantities of paper, wood and plastics can be 7500 BTUs per pound or more. Figure EF2 shows the impact of varying BTU content. It indicates that the impact of a paper only separation program increases tipping fee requirements by less than \$3/tonne. The high BTU content of industrial waste has a major impact on project economics, decreasing tipping fee requirements about \$16/tonne.

Figure EPI

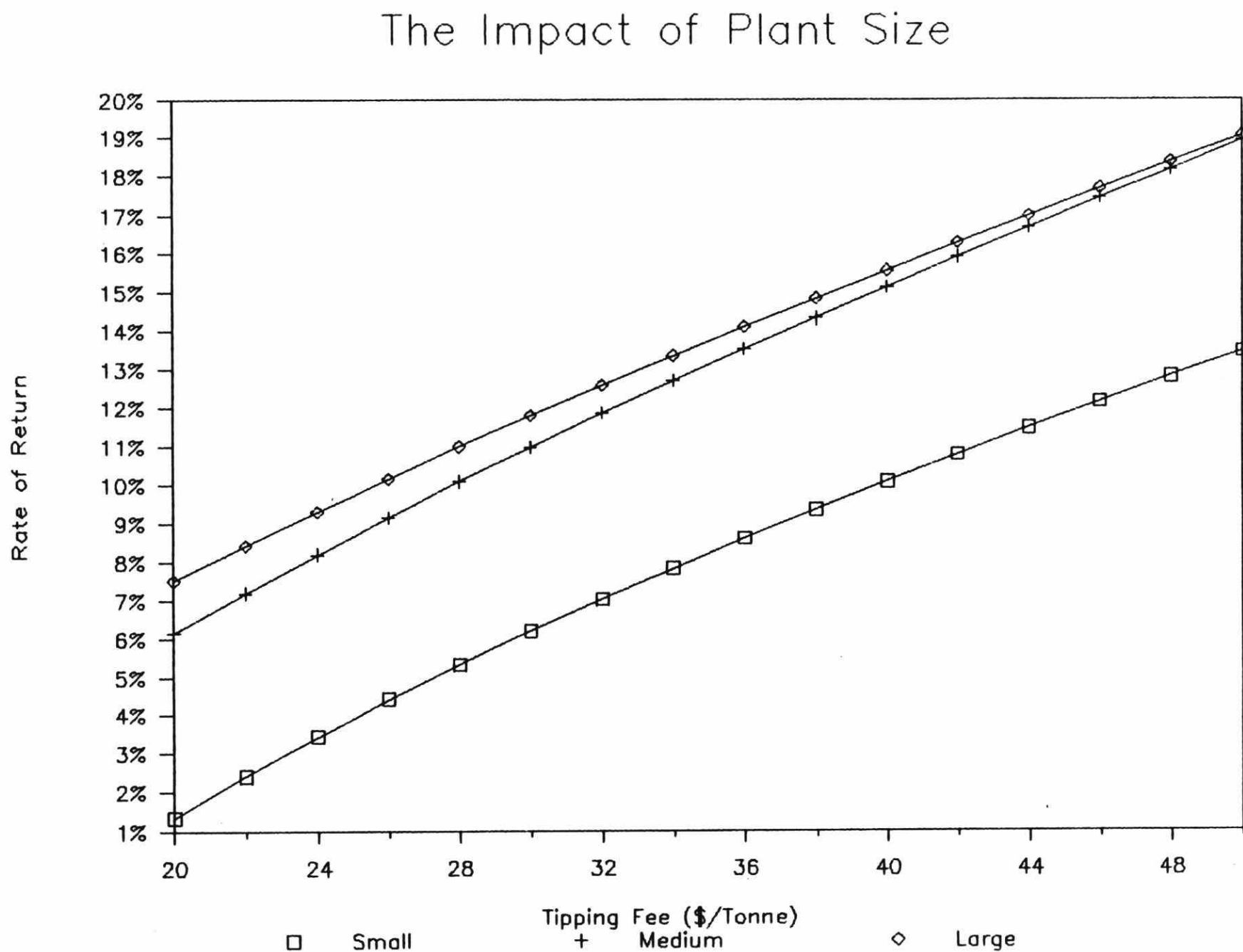
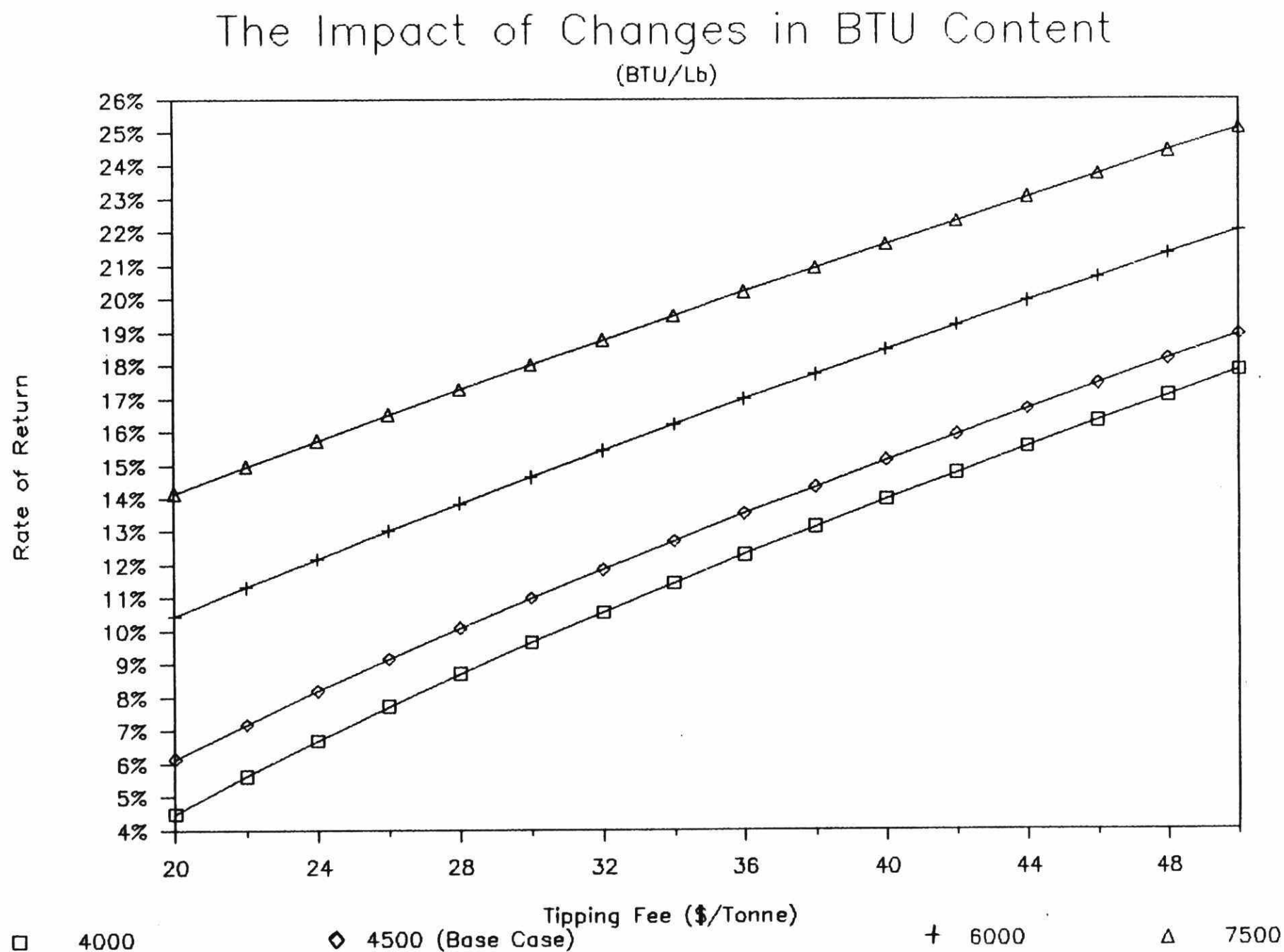
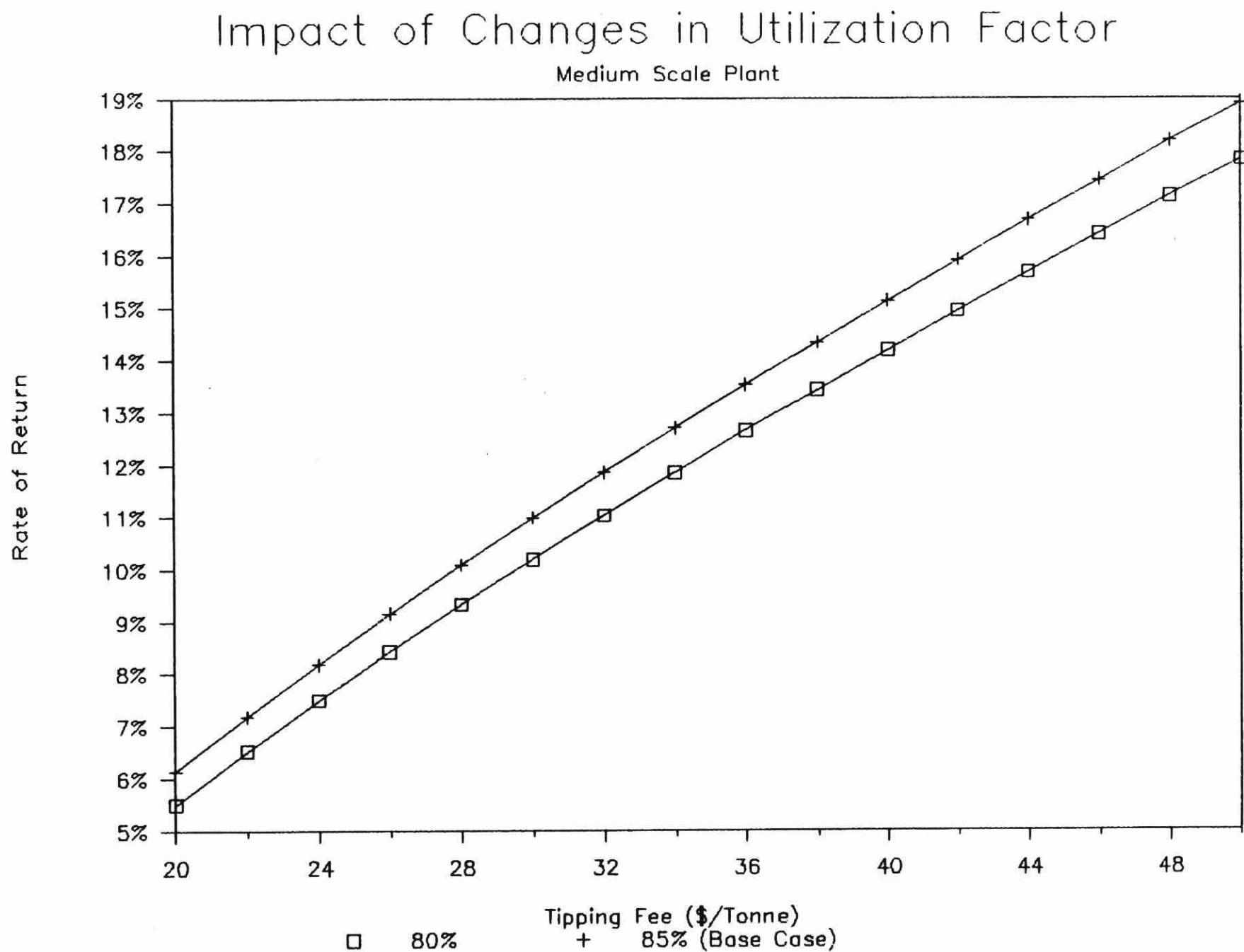


Figure EF2



- . Utilization factor: The impact of a drop in utilization factor from 85% to 80% is shown in Figure EF3. It increases tipping fee requirements by about \$2/tonne.
- . Price of energy: the discount required by the energy user can vary significantly from project to project. For example, Victoria Hospital paid an energy price in the vicinity of 1.3 times the value of natural gas replacement. Victoria Hospital was the proponent and was able to include a full savings of steam production, since it saved the value of the labour and the other non natural gas expenses associated with steam production. Projects where the energy user is not the proponent typically require a 15% discount or more to the energy user. Figure EF4 shows the significant impact that the energy premium can have on tipping fee requirements.
- . Pollution control costs:
 - Victoria Hospital pollution control costs have been included in the base case analysis. Victoria Hospital performed significantly better than Ministry standards require. An example of the impact of lower pollution control costs is shown in Figure EF5 for illustrative purposes only. It assumes a capital cost decrease of \$1.5 million and an operating cost decrease of \$2/tonne. Control requirements vary depending on local conditions.
- . Approvals costs:
 - The base case includes Victoria Hospital approvals costs. The impact of cutting these approvals costs in half and in half again is shown in Figure EF6. The reader will note that the impact on tipping fee requirements is minimal.

Figure KF3

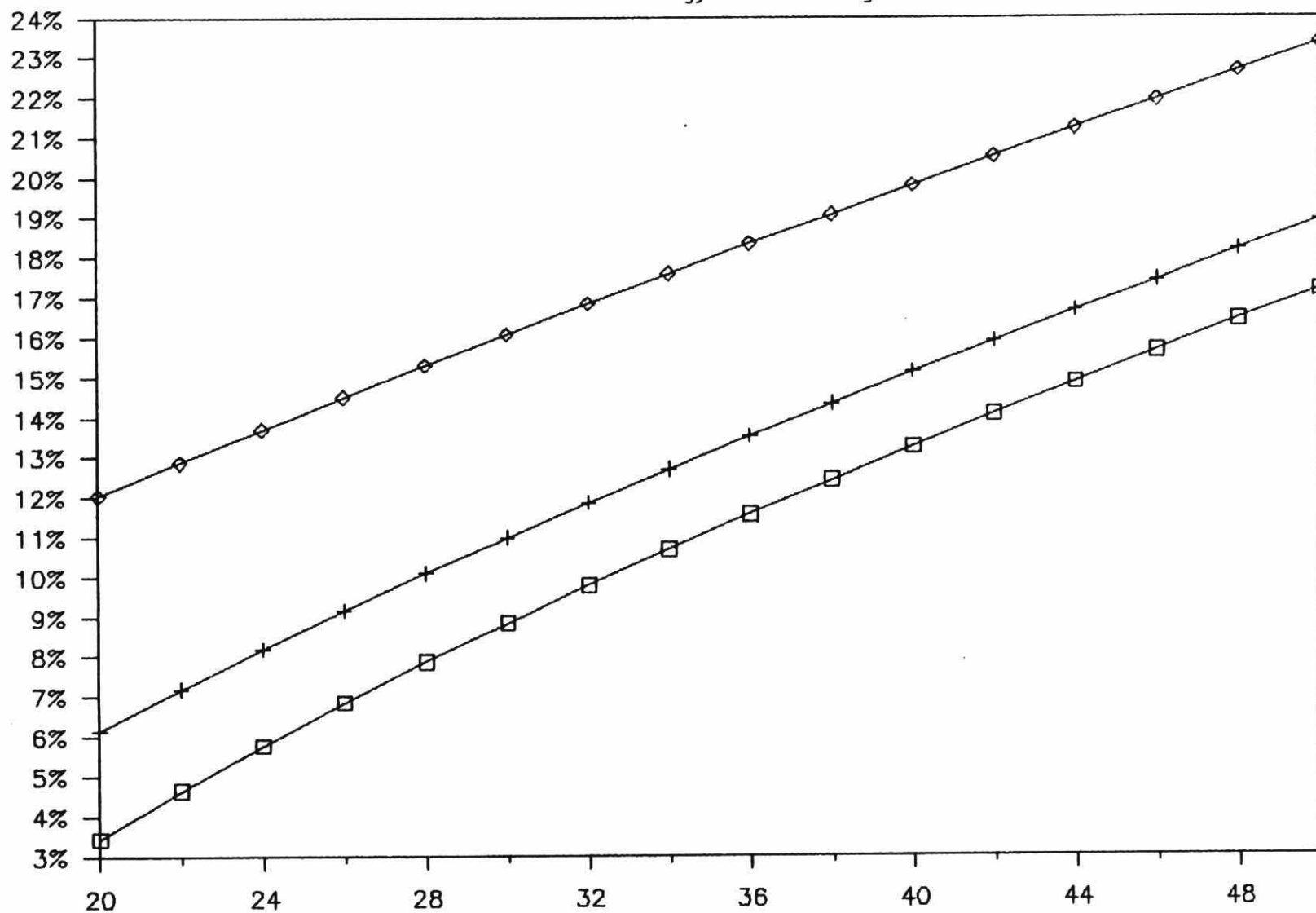


Steam Price Paid by Energy User

Price as % of Energy Cost Savings

Figure EF4

Rate of Return



□

70%

+

85% (Base Case)

◇

125%

The Impact of Pollution Control Costs

Medium Scale Plant

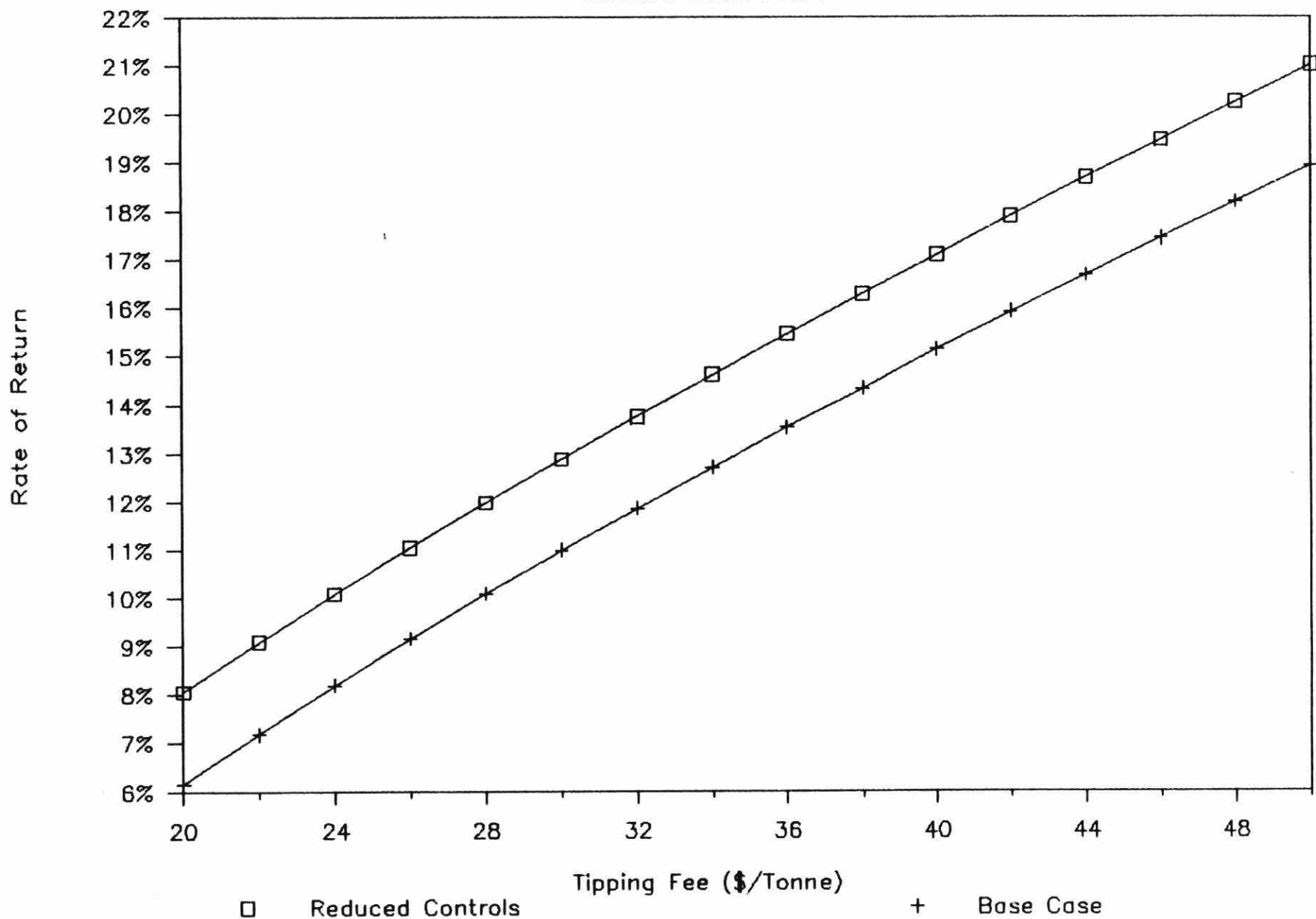


Figure EF5

The Impact of Changes in Approval Costs

Medium Scale Plant

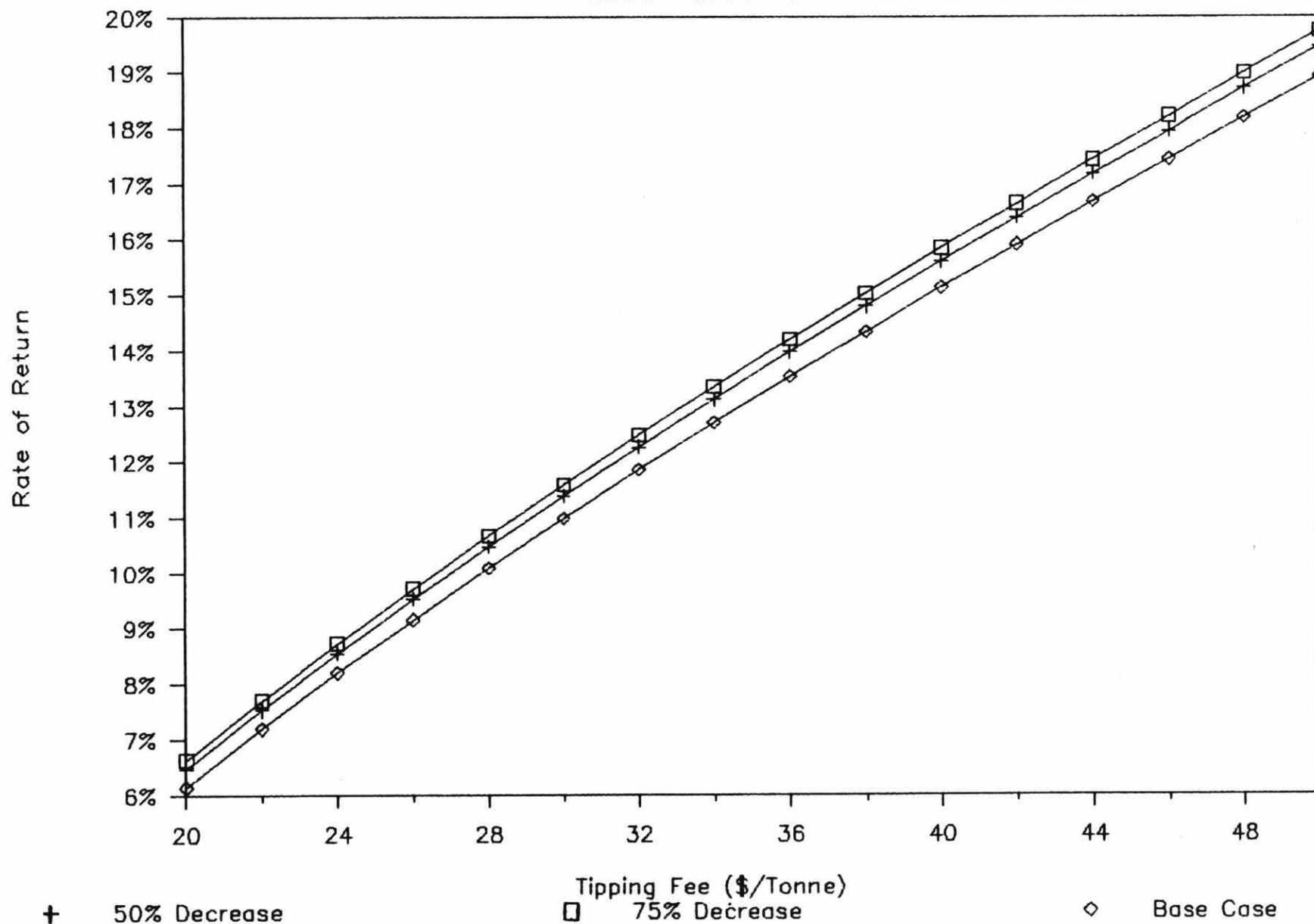


Figure KP6

. Taxes:

- Figure EF7 estimates the impact of removing Class 34. Note that the rate of return estimated is on a post-tax basis; it assumes 25% equity and 75% debt. It is also assumed that the Class 34 provision is replaced with a 20% declining balance class, and that the proponent can take full advantage of the allowable write-off for tax purposes. The impact on post-tax return is considerable. The magnitude of the benefit declines markedly however, with decreases in the percentage of the project which is debt financed and/or the ability of the proponent to use outside project income to take advantage of Class 34.

. Federal government grants:

- Figure EF8 shows the impact of removing the federal FIRE grant. It results in increased tipping fee requirements of \$6 per tonne or more for the medium sized plant.

Government Grant Requirements

Private Sector Proponent

How much will the Ontario government have to pay in order to make these projects go? It is difficult to be precise about grant requirements, because return criteria can vary significantly from proponent to proponent. Some proponents are able to take full advantage of Class 34 depreciation allowance, others are not. Some proponents will be seeking a higher rate of return than others who are in the same tax position, because their investment alternatives are more attractive.

Table E7 shows the approximate capital grant % required* given a range of tipping fees for three different return criteria:

- Case A: represents a proponent who is able to take full advantage of Class 34 by applying the write-off to income generated outside the EFW project. It is assumed that the proponent can obtain 75% debt financing at 10.5% interest and requires a 25% annual after-tax internal rate of return (IRR) on equity.
- Case B: represents a proponent who has no income outside the EFW project against which to apply the Class 34 write-off. Case A debt financing assumptions apply to this case as well. It is assumed that the proponent requires a 15% after-tax annual IRR on equity.
- Case C: represents a proponent seeking the equivalent of a 15% pre-tax IRR on total capital.

Table E7 also shows the total government grant costs and the costs per net tonne diverted from landfill associated with the different percentages of capital grant required.

Public sector proponent

- A slightly different kind of analysis was undertaken to show the impact of using a public sector proponent willing to shoulder a significant share of the project risk. It is

*Rounded to within 5%.

Table E7

PERCENTAGE GRANT ON CAPITAL COST
THREE PRIVATE SECTOR CASES
MEDIUM SCALE PLANT

<u>Tipping Fee</u>	<u>CASE A</u>	<u>CASE B</u>	<u>CASE C</u>
\$20.00	25%	40%	50%
\$25.00	5%	30%	35%
\$30.00	0%	15%	25%
\$35.00	0%	0%	10%
\$40.00	0%	0%	0%

PERCENTAGE GRANTS AND ASSOCIATED COSTS
MEDIUM SCALE PLANT

<u>Grant %</u>	<u>Total Cost (1,000 \$)</u>	<u>Grant/Net Annual Tonne Diverted</u>
5%	1,100	\$15
10%	2,200	\$30
15%	3,300	\$44
20%	4,400	\$59
25%	5,500	\$74
30%	6,600	\$89
40%	8,800	\$118
45%	9,900	\$133
50%	11,000	\$148

The Impact of Class 34 Removal

Medium Scale Plant

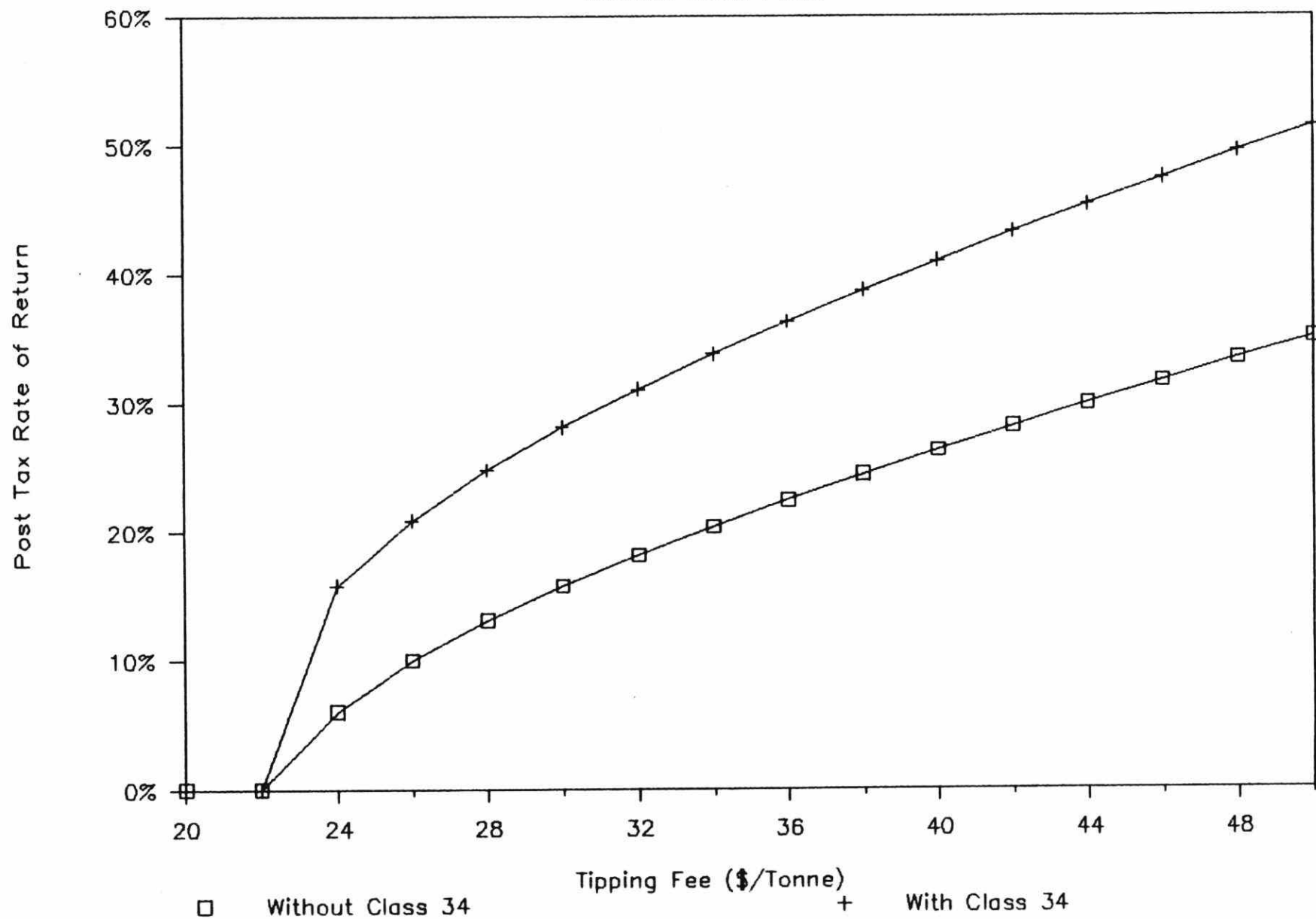


Figure EF7

The Impact of FIRE Removal

Medium Scale Plant

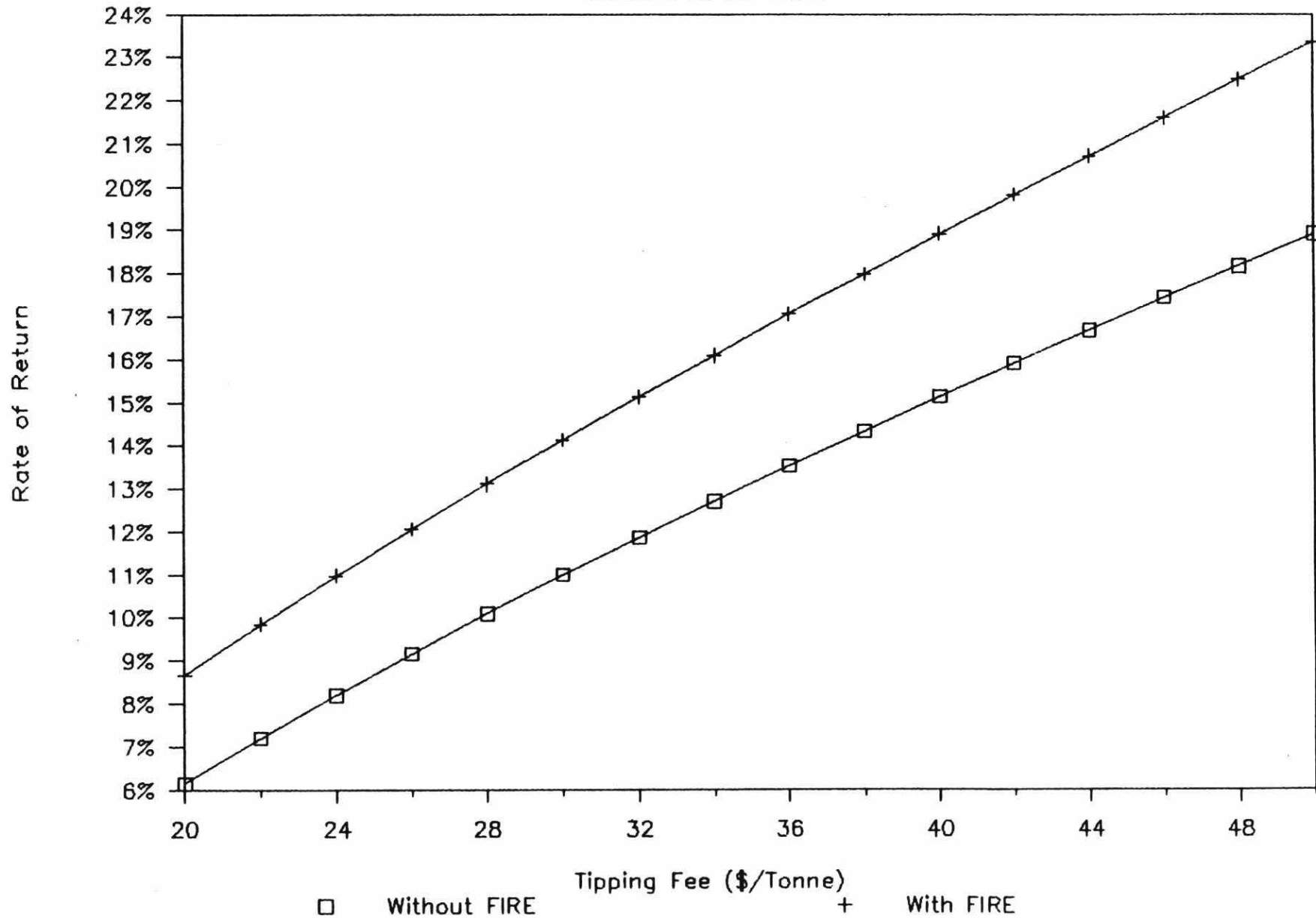


Figure EP8

Total Government Grants Required

Public Sector : Medium Plant

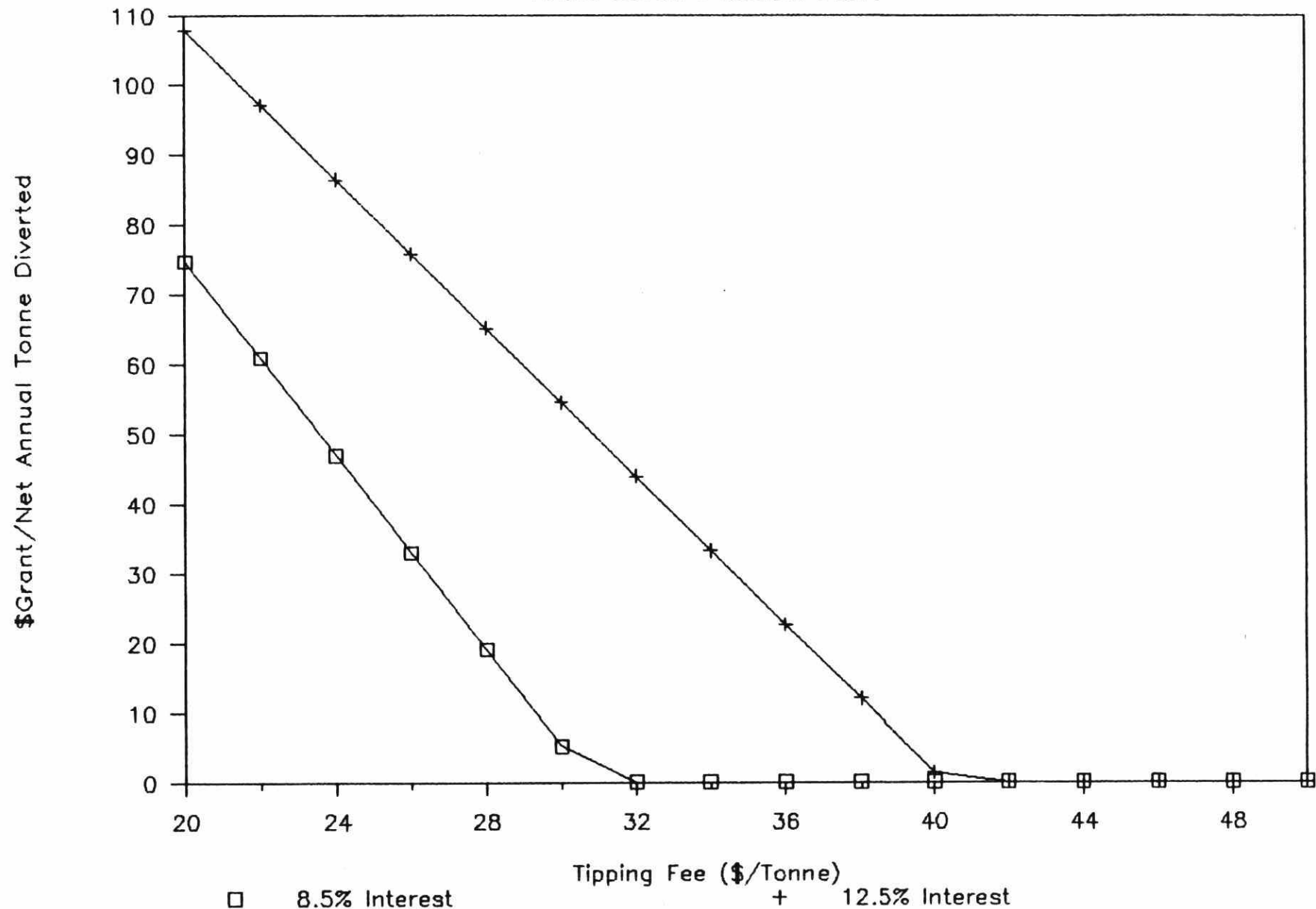


Figure EF9

assumed that the public sector proponent will finance 100% of its after-grant debt requirements and that a positive cash flow with repayment of all short term debt by the 5th year is needed. Figure EF9 compares the grant requirement for this kind of proponent for two public sector cases:

- . cost of debt at 8.5% (4.5% above the assumed 4% inflation). This corresponds roughly to the real cost of capital which public sector proponents have experienced historically.
- . cost of debt at 12.5% (8.5% above assumed inflation). This corresponds more closely to the current comparatively high real cost of capital.

All of these estimates for both private and public sector proponents must be regarded as "indicative" rather than absolute. Naturally, there will be cases in which the government grant required is less, or more, depending upon specific project configuration.

EFW and Employment

Ontario government investment in EFW results in EFW-related employment.* For consistency with past Ontario government work results, we have used the Price Waterhouse results for employment generated. That study assumed 14 person years of employment per million dollars of investment in the construction phase and 22 person years of employment per million dollars of operating expenditures.**

Assuming the medium sized plant, the totals are:

Construction Phase:	308 person years
Operating Phase:	44 person years each year of operation.

These figures have been included in the EFW model and can be used to estimate person years associated with different levels of government expenditure.***

*It is not certain that the EFW investment will create more jobs than another government investment using the funds that would have been put into the EFW project; this can be determined only by a direct comparison between alternative investments' job impacts.

**Note that these estimates do not net out the jobs displayed in the solid waste management system. This will vary from application to application. The analysis undertaken for the Victoria Hospital EA estimated a total of 7 operating jobs would be lost in solid waste transport and disposal.

***Job-related figures are very crude. The tools available to estimate these impacts do not yield reliable estimates of absolute numbers. They are normally used for comparative purposes only.

APPENDIX 5

SOURCE SEPARATION

APPENDIX 5

5.0 An Overview of Source Separation Methods

5.1 Introduction

The trend towards multi-material recycling in Ontario is bringing about the need for state-of-the-art technologies to make collection and processing of recyclable materials more cost-effective. This report provides a description of current source separation technologies now being used in Ontario, new trends and some examples of state-of-the-art technologies employed in other jurisdictions. In accordance with the terms of reference the emphasis of the report is on the residential waste stream, although commercial and industrial technologies are discussed as well.

A. Residential Collection Technologies

Various techniques are employed in Ontario to recover recyclable materials from the residential sector. The primary method of residential material recovery, curbside collection, is supplemented by apartment programs, unmanned depots and buy-backs.

CURBSIDE

Single and Multi-Material Programs

Residential curbside collection in Ontario is primarily the collection of old newspapers (ONP). Homeowners simply bundle their newspapers and set them out at the curb for collection by the recycling operator. There appears however to be a trend towards multi-material recycling. Several curbside multi-material programs have been established in Ontario during the

past two years. The following chart provides an overview of existing single and multi-material curbside programs in Ontario.

MUNICIPALITIES WHICH HAVE CITY-WIDE CURBSIDE PROGRAMS

NEWSPAPER ONLY	GLASS ONLY	NEWSPAPER, GLASS & TIN CANS	NEWSPAPER AND GLASS	
Ajax	Pickering	Kanata	Burlington	East York
Ancaster	Port Colborne		Cobourg	
Dundas	Richmond Hill		Halton Hills	
Etobicoke	Ridgetown		Kitchener	
Fort Erie	St. Catharines		Milton	
Guelph	Sarnia (Twp.)		Oakville	
Hamilton	Scarborough		Pelham	
London	Stratford		Port Hope	
Mississauga	Stoney Creek			
Newcastle	Thorold			
North York	Toronto			
Oshawa	Welland			
Owen Sound	Woodstock			
Peterborough				

Collection throughout the province is generally weekly, although bi-monthly and monthly collection also exist. Recycling operators find that weekly collections which coincide with the householders' established garbage day provide convenience and regularity and consequently substantially increase material recovery levels.

Collection Vehicles

Conventional Vehicles

Collection vehicles for the curbside programs in Ontario consist mainly of conventional trucks. The most common include cube vans, high-bed box trucks, and standard compactor trucks. The following chart briefly describes these vehicles.

VEHICLE TYPE	OPERATOR EXAMPLE	RECYCLABLE MATERIAL CAPACITY (NEWS)	COMMENTS
CUBE VAN	Halton's Recycled Resources Ltd.	1 - 2.5 tons	Allows for easier loading and maneuverability.
	Scott's Plains Recycling - Peterborough		Smaller capacity however results in collection in- efficiencies due to more frequent un- loading.
HIGH-BED BOX TRUCK	Durham Recycling Niagara Recycling	4 - 5 tons	High capacity allows route to be completed on one trip. Highbed makes loading curbside more difficult.
COMPACTOR	City of Toronto CFI - Scarborough	4 tons	High material TRUCK capacity; easy loading/off loading High operating costs.

Collection crews usually consist of one driver and one or two helpers loading the truck.

Specialized Collection Vehicles

The inception of curbside multi-material recycling in Ontario requires operators to consider more innovative collection techniques. Although primitive collection techniques exist, two Ontario multi-material programs have adopted specialized recycling trucks to make collection more efficient.

The trucks which are manufactured by Belgium Standards Industries Ltd. are presently being used in the Total Recycling program in Kitchener. They will also be employed by Niagara Recycling in their multi-material recycling program in Niagara Falls. The truck is designed to allow a one-man collection operation and obviously minimizes collection labour costs. The dual drive enables the driver to drive the route on the right hand side in a stand-up position and simply step off and side load the materials from the right hand side. The 17 foot body has three compartments to accommodate the separated news, glass, and metal and is hydraulically rear-dumped with dividers that swing open to allow offloading of each material. If required one or two of the dividers can be removed to accommodate either a news and co-mingled glass and metal collection, or a single-material collection. The capacity of the truck with a normal mix of recyclable materials is approximately four tons.

Different vehicles along the same theme are being used in curbside collection programs in the United States. Examples of these are the vehicles used by Marin Recycling in San Rafael, California and the trailers used in New Jersey recycling programs.

The dual drive trucks used by Marin Recycling basically consist of three self-dumping containers attached onto a dropped frame. The three compartments for the collection of news, glass, and metal are 5.2 cubic yards, 3.5 cubic yards and 3.5 cubic yards respectively. The trucks are manufactured by Able Body Co. Inc., in Newark, California.

The self-dumping trailers used in New Jersey consist of four self-dumping compartments and can be attached to any type of truck. The trailers are 24 feet in length with a 15 cubic yard capacity. Dividers are removable and the sides of the trailer drop for easy loading. The brand name of these particular trailers is Eager Beaver Recycler Six and are manufactured by General Engines Co. Inc., in New Jersey.

In-Home Recycling Containers

Special in-home recycling containers are used in a few multi-material curbside collection programs in Ontario, including the City of Kitchener, Hamilton, the Aldershot area of Burlington and a small section of the Beaches and High Park neighbourhoods in Toronto. To date the containers are basically a high density polyethylene rectangular box. The glass and metal are usually placed in the container and the bundled newspaper placed on top. It is speculated that containers are cost-effective.* While there are a number of apparent advantages to container use, the first and foremost is that it significantly increases participation rates, particularly in the glass and metal fractions. A pilot study in Kitchener for example found cumulative participation rates more than doubled for glass and almost tripled for metal when containers were used. The increase in newspaper participation was 25%. Monitoring in the Toronto area in a different study found an overall doubling of existing participation rates when containers were introduced.

Other apparent advantages of in-home recycling containers include promotion and collection efficiency. The container is a constant reminder to recycle. Peer pressure becomes a motivating factor when most of the neighbours have their recycling box at the curb. It is also assumed that distribution of containers gives an image of stability and credibility to a recycling program.

*Grimsby purchased 5500 containers for the operator at their cost. A recent newspaper article claims that container costs have almost been recovered in the first month of program operation.

Containers also make collection more efficient. Containers make recycling set outs clearer to the collection crew, minimizing the need to stop and examine open bags and boxes at the curb. Collection efficiency is also improved by minimizing the number of stops required per route since homeowners tend to save their material until their container is full. Monitoring of set-outs in the curbside program in Kitchener found that the average homeowner sets out his container once every 2.3 weeks.

Different attempts in other jurisdictions to containerize recyclable materials for curbside collection include three-tiered stackable containers, pails, coloured bags and special tags to attach to garbage bags to identify recyclable material. Other possibilities in collection techniques could include such variations as recyclable materials placed in different coloured bags, and put out at the curb with regular garbage bags. The recyclables and garbage would then be collected by the same truck and sorted later. This is the current practice in a few U.S. programs.

Co-mingling

Most multi-material source separation programs in Ontario traditionally request total separation of the material by the homeowner before it is set out at the curb. Co-mingling of materials is more widely practised in U.S. curbside programs both for reasons of convenience and as a deterrent to theft of the high valued aluminum containers from the curb. Co-mingling of glass and metal is thus likely to become more prevalent in Ontario should aluminum cans enter the waste stream.

APARTMENTS

Apartments over two or three stories are not generally part of a curbside program. Collection from apartments in Ontario is usually done in one of three ways:

- . Tenants take material directly to central depot, container or storage area in the parking lot or basement. Recycling operator picks up material.
- . Materials are set aside by tenants in regular utility/garbage rooms on each floor. The superintendent collects the material on a regular basis and moves it to a central storage area or container. Recycling operator picks up material. A financial incentive to the superintendent is usually required.
- . Volunteer collection drives by local groups such as the Scouts. Material goes through recycling operator's buy-back program.

Although apartment buildings, particularly high-rise, present the recycling operator with potentially attractive economies of scale achievable by recovering large volumes of material from a single location, recovery systems must be designed to overcome the barriers that operators have come up against such as fire regulations, safety requirements and proper location. Until these barriers are overcome and proper systems designed, material recovery from apartments in Ontario will remain as it exists today, extremely minimal.

UNMANNED DEPOTS

Unmanned depots are presently employed in Ontario to collect news, glass, and metal from urban areas, rural areas and as mentioned earlier the apartment sector. Depots in urban areas such as the T.R.A.C. (Toronto Recycling Action Committee) depots operated by the City of Toronto are set up for the drop-off of glass and metal by city residents. They are placed in such locations as schoolyards, firehalls, grocery store lots and beer store lots. Existing depots to service rural areas are in such locations as general stores, garages, landfill sites, transfer stations and recycling operator's plants.

Attempts are generally made, however, to locate the depots* on existing trip patterns to increase participation by the residents.

In general, material recovery is substantially lower from depots as compared to curbside due to the inconvenience to the residents.

Depot technology, particularly with regard to the handling and unloading of the material is far from advanced in Ontario. Basic depots and primitive handling and collection techniques are being used, resulting in major cost inefficiencies. In almost all cases, collection of the material from the depots is performed manually. The most common techniques used are "handbombing" the newspaper and either shovelling out the glass and metal or lifting and emptying containers such as forty-five gallon drums which are used within the depot to contain the material.

It is likely that the technology and design of depots as used in other jurisdictions to allow for efficient material handling will be adopted here in Ontario. There are variations to the actual aesthetics of the depots but all are unloaded mechanically.

There are 25,000 "Igloo Collection Bins," for example employed in Europe to collect news and glass. The depots are round in shape with a space-age appearance, and range in size from 1.2 cubic yards to 4 cubic yards. They are lifted with a hydraulic arm or crane over the truck at which time an automatically released trap door at the bottom of the depot opens permitting the material to fall into the waiting truck.

A possible development specific to the rural sector is the set-up of comprehensive drop-off centres located at the recycling operators' rural processing site. These sites can sometimes be optimally located at the local landfill site where rural residents bring their garbage. This is more common in the U.S. in operations such as the Wilton Recycling Centre in

* Aurora and Toronto Recycling Action Council Data indicate this.

Wilton, New Hampshire or the El Cerrito Drop-Off Centre in El Cerrito, California.

BUY-BACK

Buy-back centres such as the one operated by Total Recycling in Kitchener and Niagara Recycling in Pelham are primarily employed to accept recyclable material which is collected by volunteer fund raising groups such as local Scouts and church groups. Buy-back centres are also used to appeal to the segment of the population which will recycle only if there is a direct financial incentive including both the general public as well as scavengers. When employed as a supplemental collection technique to an overall recycling operation, buyback will recover additional material not normally recovered through the curbside and depot approach.

Attempts have been made to make buy-back more convenient. C.F.I. for example ran a newspaper buy-back operation at several Dominion store locations in Toronto until very recently. Participants drop off their bundled newspaper on their way into the store and are reimbursed with vouchers to apply against their grocery purchase.

Theme Centres are part of the buy-back approach, are used in the U.S., and can be expected here in Ontario should existing container legislation be changed. Apart from the financial incentive the centres attempt to attract people by making recycling fun. Centres are generally located near densely populated areas.

The Toledo Recycling Station and the San Diego Recycling Circus are two examples of successful theme centres in the U.S.

The Toledo Recycling Station in Toledo, Ohio is set up as an old fashioned railroad station. The parking lot looks like a railroad yard and the recycling machines take on characters such as "Casey the Can Crushing Dragon" and "Count Crackula", a glass crusher. The Toledo Station recycles approximately 4,000 tons of material per year.

The San Diego Recycling Circus, in San Diego California follows a circus theme and recycles approximately 1,500 tons of material, annually. Mobile theme centres are prevalent with used beverage container (U.B.C.) recovery in the U.S., and may be seen in Ontario in the future.

OIL COLLECTION

It has been estimated that approximately 50% of the motor oil sold, is purchased by do-it-yourself oil changers. While many service stations have been accepting used motor oil from local residents for a number of years, few programs have included this material as a component of a multi-material recycling program.

Total Recycling in Kitchener, collects waste oil along with their regular weekly curbside collection. Residents are asked to discard used motor oil into four litre plastic containers (such as bleach bottles) and set them at the curb, along with other recyclable materials, on the designated collection day. Crews load full containers on the truck and then empty the contents into a 500 gallon tank located at Total Recycling's operations yard. The oil is then collected and re-refined by Breslube.

Used motor oil collection is also a part of some curbside recycling programs in New Jersey. At the start of the program each of the residents were given a plastic container to store their oil. When the full container is picked up an empty container is dropped at the curbside by the operator. It is worth noting that in this program, half of the revenues from the sale of the oil are donated to the Muscular Dystrophy Association which seems to be an added incentive to the homeowners to participate.

Several southern Ontario municipalities provide waste oil depots where residents can bring their own motor oil. Mississauga, for example has two five-hundred gallon drums located at their landfill site to accept oil from local residents. The oil is then sold directly to the rerefiners. At a

Scarborough Public Works yard, participants deposit both oil and container into a depot, which are later collected by works crews.

Due to the environmental hazards of improper disposal and the expected demand from the re-refining industry it is possible that waste oil collection may prove to be more of a major component in source separation programs in the future.

REVERSE VENDING MACHINES

Reverse vending machines are a classic example of a technological response to an untapped market segment. Approximately 50-60% of aluminum U.B.C. in the U.S. is presently being recovered. The reverse vending machine is an attempt to raise this recovery level by offering convenience and a financial incentive to appeal to the segment of the market who are not presently recycling.

There are approximately 1,800 reverse vending machines presently in use in the U.S., primarily in deposit states. They are conveniently located, generally in supermarkets. Approximately 75% of the machines are in-store type models such as the Envipco Can Redeemer. The remainder are large outdoor models which take up the space of a parking lot, such as the Golden Goat.

The maximum theoretical feed is 1 can per second, although this rate cannot be achieved in practice. The machine sorts out the aluminum from other containers, weighs or counts the aluminum and dispenses either coins or coupons to the customer. The machine also crushes the containers. Capacity for these machines range from 250 lbs to 3,000 lbs of scrap metal.

Although overwhelmingly used for aluminum, the machines are expected to be used for other materials as well. There are presently 80 prototype glass machines in New York City and a P.E.T. machine is expected on the market in mid-1985.

B. Commercial/Industrial Technologies

IN HOUSE/PLANT-SORTING

Commercial Old Corrugated Containers

There are a variety of collection and handling methods in use, depending on the generator size, location and storage capacity.

At-source separated old corrugated containers (OCC) are collected from generators either in loose or baled form. Most smaller generators, or those with ample storage facilities, fall into the former category. Flattened OCC is loaded either by hand or fork lift truck into the collection truck. One major recycling firm, Atlantic Packaging, uses compactor trucks to overcome the serious collection inefficiencies posed by the low weight per volume of the material.

Some generators pile sheets of OCC into a bulk lift container which is shipped to the processing firm. While it is an extremely light payload, it has the advantage of avoiding cumbersome manual handling.

One Oshawa operator employs a portable system by mounting a mobile half ton baler on the back of a rolloff flat bed. The truck can accommodate two half ton bales. The baler can also be rolled off the back of the truck and used at the warehouse. Some major generators, such as grocery or department stores, bale it themselves. Sometimes this is done in conjunction with an OCC market who help finance the baler.

Contamination is rarely a problem with most OCC recycling programs. Metal strapping and plastic wrapping can easily be separated out as the boxes are broken down for disposal.

Commercial Fine Paper Recycling

Fine paper recovery programs currently exist in some commercial and government office buildings.

The desk top recovery system found in many federal and Ontario government buildings is an at-source recycling program which requires each office employee to separate recoverable paper grades from regular refuse using a "desk top" holder. The paper is then centralized into steel or fibre bins located in high traffic areas on each floor. Cleaning staff are usually responsible for moving the paper, contained in jute bags, to a designated pick up location. Material collected through this system is usually sufficiently contaminated (kraft envelopes, plastic cups etc.) that it must undergo hand sorting at the processing facility prior to baling.

A more popular, and lucrative strategy, recovers only the paper generated from heavy paper stream departments or companies, for example, print shops or computer facilities. This generally yields a higher grade of paper which requires minimal sorting. The paper is deposited into central bins such as drums or wheeled carts. When implemented in conjunction with a desk top program, recovery rates are minimized. When used in isolation, it requires less employee training and fewer capital costs. For this reason, the collector usually agrees to purchase the paper on a per ton basis from the participating company.

For companies who generate an inordinate amount of high grades, and offcuts, (for example, greeting card manufacturers) an in-house recovery program is generally self initiated. A baler is included as a portion of the waste handling system.

Confidential record destruction often presents an ideal recycling opportunity, if there is minimal plastic and metal contaminants mixed with the paper, and many recycling operators market this as a service.

I.G. Recycling in Brampton, for example, convert discarded records directly to paper pulp which is then used in the manufacturing of roofing shingles.

Alternately, material can be shredded and baled as a low mixed paper grade.

Schools

Some schools have implemented paper recovery programs. Each class is provided with a central bin (such as a brightly painted box, or, in the case of a recently introduced program in Toronto, uniform plastic tubs). Students are responsible for delivering classroom accumulation to the central storage area and ensuring it does not contain any contaminants.

Frequent collection is mandatory because of strict fire regulations governing schools, and the nature of the situation. School programs, from a collector's point of view, are often not cost effective. There are, however, educational benefits which often spin off to other family members at home resulting in increased participation in a curbside recycling program where available.

Commercial Glass Recycling

Commercial at source glass recovery can be found in the Cities of Ottawa and Toronto.

In Ottawa, the program is administered by the City, but the actual collection is carried out by the City's garbage contractor, Provincial Sanitation. Each of the approximately 30 participating restaurants and hotels, have been provided with a 2 cubic yard bulk lift container. Several restaurants faced with serious space limitations, use 45 gallon drums instead. Kitchen and bar staff are restricted to discard glass containers into designated tubs, which are regularly emptied into the bins or drums provided. Once a week, a city representative inspects each box and notifies Provincial of any that require servicing. Up until several months ago, the glass was delivered directly to market. Because of recent contamination

problems, the glass is now delivered to a works yard where it is hand sorted by ARC Industries employees. It is then loaded by a small front-end loader into a tractor trailer for shipment.

In Metro Toronto, the commercial glass collection is administered and operated by the firm, Glass Reclaimers of Canada. Participating establishments are furnished with plastic wheeled drums which are emptied once or twice a week. Glass is delivered directly to market. Contamination problems are immediately reported to the offending business and, if it persists, the service is discontinued.

Most Glass Reclaimer customers are located in the heart of downtown Toronto. Since many do not have the physical space to accommodate a bulk lift disposal container, they rely on the City's commercial collection which restricts the volume of waste permissible. The opportunity to divert the glass fraction from the waste stream is clearly valued.

Commercial Metal Collection

Most manufacturing companies who generate even small amounts of waste metals, such as brass, iron, aluminum and canning scrap, separate these out from their waste stream because of their high economic value. These are usually stored in designated roll off containers adjacent to the garbage roll off containers.

Small Collectors/Scavengers

When market conditions are favourable, it is common for independents to scavenge small loads of loose material from fibre rich commercial waste set-outs. For example, many retail outlets discard a high proportion of OCC, which must be flattened and bundled for municipal collection. It can thus easily be scooped up and loaded into a passing pick-up truck or van. Because the average value of material collected, is relatively small, it is generally marketed to a local buy-back centre.

Post Collection Sorting

Hand sorting from mixed waste loads is of growing importance as a waste reduction technique.

C. INTERMEDIATE PROCESSING

Material from recycling operators in Ontario are either shipped to an intermediary or broker for processing and upgrading or are sent directly to the end-use industry. For example, Rosen Industries is an intermediary which purchases glass from recycling operators, processes it to a furnace-ready state and ships to the glass companies. Some of the larger operators, such as Total Recycling in Kitchener and CFI process their news to a de-inking grade and ship directly to the end-user, Ontario Paper.

Baling

Most paper grades such as newsprint, high grades and OCC, are baled at the processing plant to facilitate storage, and permit efficient handling and shipping to the mill.

Mills stipulate the exact percentage of allowable contaminants, according to grade. While specific figures vary with each mill, newspapers, for example, commonly must contain no less than 5% outthrows. Quality demands increase with a corresponding increase in paper grade. It is not uncommon for an entire load to be rejected because a sample bale does not meet the specifications; program operators must ensure adequate provisions are made for sorting and contaminant removal. High grades are meticulously sorted by hand in special areas set aside for this task. Newspapers collected from a curbside program, on the other hand, are usually sorted as they are unloaded from the collection truck; strings are cut and discarded and plastic bags are removed. Excess magazine stock or other contaminants are tossed aside just before baling.

While there are a variety of baler designs in use, the principle is identical. It is simply the hydraulic compression of material into an

extremely dense cube. The baler type used depends on a number of criteria such as spatial limitations, available manpower, price, and required throughput. For example, a basic upstroke baler usually processes one ton of news per hour; a high density upstroke baler or a horizontal baler processes 2.5 tons per hour; and an automated horizontal baler can process 7-8 tons per hour.

The degree to which the baling process is automated, depends largely on the size of the operator. Some smaller companies load the baler by hand, for example, while larger ones use one or more conveyor belts to increase efficiency. Similarly, some balers must have each bale tied off manually, while others have an automatic tie feature. Other materials such as PET and aluminum can also be baled, with the same baler or with a more specialized unit (depending usually on the total volume handled).

Glass/Metal Separation and Processing

Since multi-material recycling is relatively new in Ontario glass and metal sorting, contaminant removal and processing by operators in Ontario is primitive.

As glass and metal volumes increase, however, with the trend in Ontario towards multi-material recycling programs and with the anticipated additions in the waste stream, such as PET and aluminum and the resultant co-mingling it can be expected that the appropriate technology will be adopted. As it is highly probable that the technology will be adopted from the U.S., the following is a brief description of three of the most efficient operations in the U.S.

Resource Recovery Systems Inc.
Groton, Connecticut

Incoming glass, tin cans, aluminum cans and PET are received mixed together. The glass and metal separation and processing equipment basically consists of a hopper, conveyor belts, magnetic separator, can flattener,

glass crushers (also mechanically removes metal rings) and standard operating equipment such as balers. The result of the process is furnace-ready glass cullet separated by colour, flattened tin cans, baled aluminum and baled PET. Labour includes six men mostly engaged in on-line sorting. Claimed capacity including paper products is 40 tons per day.

Recycling Enterprises Inc.
Oxford, MA

The system in Oxford is mechanically similar to Groton but more extensive. Approximately 10,000 tons per month of material consisting mainly of glass with minor amounts of tin cans, aluminum cans and PET are processed. A pertinent difference from the Groton system is that material is received in a much cleaner state due to a greater emphasis placed on sorting at the point of separation. Plastic recycling is also more advanced and includes current research to develop a plastic processing system which can convert PET bottles into their basic terephthalic acid (T.P.A.) component. This latter system is still at a laboratory stage.

Marin Recycling
San Rafael, California

Marin Recycling processes approximately 1,000 tons of recyclable material per month (including newspaper). Glass and metal is side-dumped from the separated compartments on the recycling truck into two respective hoppers a level below. The glass is disbursed from the hopper with a mechanical regulator onto the conveyor belts where it is manually sorted by colour and contaminants removed. The glass then falls off the conveyors into the waiting bins. When full the bins are then hydraulically dumped into large roll-off containers for shipment.

The metal is disbursed from its hopper in the same manner and runs through a magnetic separator, sending ferrous cans along one conveyor line and aluminum along another. Contaminants are manually removed along the sorting belt. The ferrous drops off the conveyor into waiting bins and is dumped

and shipped similar to the glass. The aluminum is mechanically crushed and blown into a large container for shipment.

The following is a brief list of equipment that we may see being used by recycling operators in Ontario in the future.

- . Glass crushers - provides uniform cullets acceptable to the recycling industry. Reduces volume of the glass 3 to 1 to make shipping more cost-effective. They range from small crushers with a capacity of 2000 lbs./hour to large glass reclamation systems that process 60,000 lbs./hour.
- . Can crushers - reduce volume of cans 4 to 1. Usually as simple as a drum against a steel pressure plate. Once again range in size with an average flattening capacity of 1,500 lbs. of aluminum beverage cans/hr. or 6,000 lbs. of steel beverage cans per hour.
- . Can sorters/magnetic separators - cans are carried over a magnetic head which mechanically separates steel cans from aluminum. Basic models have a capacity of approximately 4,000 lbs./hour. Models that are part of larger processing systems can however sort up to 50,000 lbs. per hour.
- . Flatteners/blowers - mechanically flattens and blows cans through a tube into a waiting container for shipment. Normal flattener/blowers can get approximately 15,000 lbs. of aluminum cans in a 40 foot trailer while the super flattener/blowers average about 25,000 lbs. of aluminum cans into a 40 foot trailer.
- . Densifiers - mechanically flattens and hydraulically densifies aluminum or ferrous into "biscuits." The biscuits are 10 3/4" X 10 3/4" X 7 3/4" in dimension and have a density of 40-45 lbs. per cubic foot for aluminum and 20 lbs. per cubic foot for steel. The biscuits are then bonded together for shipment. The capacity is

1,000 - 2,000 lbs. per hour. Densifiers can get 40,000 - 50,000 lbs. of aluminum cans into a 40 ft. trailer.

- . Can-buyers - used in buy-back operations and automatically sorts and weighs cans and prints out cash payment due to the customer.

Basically consists of a hopper, conveyor, magnetic head and scales. Average capacity is 1,000 - 2,000 lbs/hour.

D. SHIPPING

Recyclable materials from the recycling program operators and intermediate processors in Ontario are generally shipped to the end-use industries by conventional methods. Paper fibres are generally shipped baled and in conventional trailers. The capacity of a conventional tandem trailer is approximately 26 tons of baled ONP while a flat-bed trailer can carry up to 30 tons of baled ONP.

The Ontario Paper Company in Thorold is however establishing a loose delivery system and hopes to increase its capacity for acceptance of loose ONP substantially - Niagara Recycling, the local OPRI dealer for the Niagara Region, for example, presently ships all its news loose in large roll-off containers to the Ontario Paper de-inking plant in Thorold. CFI does the same with its news from Metro.

Glass and metal from the recycling operators are generally shipped in large roll-off containers.

The major effort to minimize shipping costs comes in the processing (i.e., compaction-flatteners, densifiers etc.) of material which has been dealt with in the previous section. Cost effectiveness becomes a major problem however when the recycling operator is a long way from markets, such as Northern Ontario. Backhaul opportunities must be taken advantage of in these cases for recycling to be economically feasible.

5.2 Actors, Decisions and Possible Government Initiatives

1.1 Decisions, Actors and Decision-Making Criteria

There are two key decisions for source separations:

1. The decision to establish a source separation program.
2. The decision to continue the operation of a source separation program which has already been established.

In contrast to the EFW situation, the initial decision to establish a source separation program does not weigh nearly as heavily in its ongoing operation. Once the decision is made to establish a program it can be withdrawn relatively easily, due to the comparatively low capital intensity of this option.

1.2 Actors Directly Involved in the Key Decision

There are two actors directly involved with these two decisions:

- . operators of source separation programs
- . the municipality in which the program is taking place

Operators of source separation programs are briefly described below; municipalities have been dealt with in depth above.

A. Voluntary Groups

Voluntary community-based groups with an environmental orientation have been active in establishing ongoing source separation programs. Their objectives have been to show that such programs can work in order to convince other actors -- especially municipalities -- to participate and implement these programs.

The groups are motivated by environmental concerns and have drawn extensively on voluntary labour to establish the programs. This operator type was most prevalent during the 1970's when the environmental perspective for recycling was gaining its first momentum. This group has proven itself not to be sustainable over the longer term, given its lack of business perspective and economic viability.

B. Private Ownership: Third Sector

A number of private groups have been engaged in source separation programs with the objective of having these programs assist with other social objectives -- providing employment and/or training to the disadvantaged or handicapped. These groups often work on a not-for-profit basis. They are using source separation as one way of providing jobs and skills.

Usually they require and obtain some kind of government subsidy to provide this kind of service. They need to be economic (including the grants) in order to survive. Because they are not for profit, their rate of return requirements are not high.

C. Private - Traditional Business Sector

Source separation has not attracted many private sector business participants with a perspective of using recycling to make money. The economics has simply not been there in the past.

However, lately some companies in the waste management business, have been attracted to source separation programs. For example, Laidlaw and Waste Management Inc. have offered recycling services to municipalities as part of their waste management expertise. There appear to be two reasons for this:

- . Source separation programs provide a way of distinguishing these companies from their opposition. In a period of increasing competition, and increasing opportunity, for waste management companies, this has been a way for these companies

to acquire waste management contracts they otherwise might not have. Nyle Ludolph of Laidlaw has been quite candid about this. He states these programs offer a "carrot" to help his company get waste management contracts. (e.g., See Resource Recycling, Vol. 2, No. 5, page 15). Since this statement, other waste management companies have begun to offer recycling. The recent tender call from Mississauga required bidders on the solid waste management contract to include source separation; thus, this capability is becoming more of a requirement than a marketing extra.

. These companies may be able to use their position as collectors and disposers of waste to gain economic benefit from recycling. There are two aspects to this:

- Since these companies are directly involved with waste management activities, they may be able to gain economic advantage through one or more of: savings in tipping fees, sale of materials, cost-effective utilization of existing equipment and/or sophisticated new equipment designed specifically for source separation.
- Obtaining payment from the municipalities (or other government sources) to include recycling as part of their operations. Municipalities pay a certain fee for recycling -- for example, so many cents per capita.

These companies require a higher rate of return than the third sector private firms. It is possible that, due to the integration of their activities with regular collection, the higher return requirements are balanced by better cost performance, meaning that programs operated in this fashion may be no more costly or even cheaper.

While in the short term these firms may engage in "lost leader" recycling activities, over the longer term the activity has to make money for them or they will not engage in it. Specific criteria vary with the company but profit margins in the 15% to 30% range are probably accurate. Currently, Laidlaw in particular is very active in promoting recycling activities.

D. Municipalities

Some municipalities are involved in undertaking source separation activities. Usually this is handled by the public works department as part of the waste management activity.

There are a number of factors which may induce municipalities to become involved:

- . They view recycling as a suitable ancillary activity to their solid waste management function -- it assists the cost performance or other aspects of their system -- for example, they have slack resources.
- . Public pressure and/or positive attitudes on the part of the staff are usually involved as well.

Conclusion

While there are a number of other factors at play, it is clear that the primary concern is economic viability. Economic viability is different for different types of program operators.

1.3 Actors Involved in Other Decisions

There are a number of subsidiary decisions upon which the viability of source separation programs depend:

1. The decision to provide source separation materials to the programs.
2. The decision to purchase materials from the programs.
3. The decision to provide outside financial and other assistance to the programs.

There are a number of different actors involved with these decisions.

1. Decision to Provide Materials to the Programs.

Most of these programs are directed at the domestic sector. However, there is a good deal of material available in the small commercial industrial sector.

1.1 Householder

The householder's decision to participate in the source separation program is critical. The following appear to be the key factors in influencing that decision:

- . Attitude: the extent to which the householder is convinced that participating in a source separation program is a "good thing".
- . Convenience: all programs have found that convenience is essential to widespread participation. Convenience has a number of different dimensions -- for curbside fitting in with the regular municipal collection routine and ease of material preparation; for depots and buy-backs, it is proximity to regular trip routes.
- . Economic incentive: in Ontario householders do not pay for solid waste disposal services according to the quantity of waste they generate. Economic incentive therefore is payment for materials contributed. Typically, in Ontario these materials have not had sufficient economic worth to permit program operators to pay

householders for these materials. However, buy-backs have been set up and have had some success in certain areas in encouraging deposits of newspapers.

- . Awareness: householders must be aware that the program exists and know where and how to participate in it.

The major difference in the urban areas is between apartment and non-apartment dwellers. Curbside programs are not appropriate for apartments.

1.2 Commercial and Industrial Waste Generators

Major materials available from the commercial and industrial sector are corrugated and fine papers. The incentive for these actors to participate in the program is primarily economic. In those cases where operators pay by the tonne for materials disposed of, there is an incentive for them to participate in a program which lessens the amount of waste requiring disposal.

2. Decision to Purchase Materials from the Program

Secondary materials purchasers are brokers and dealers involved in the secondary materials business. Users of materials (such as Ontario Paper) can also be involved with the purchase of the material directly from the programs.

The decision to purchase materials from the program really involves two decisions -- quantity and price. These decision are dominated by:

- . Nature of the market -- the demand for the material by final users and the availability of material from other sources. Other sources of material include both material from other programs in Canada (and non-post consumer programs such as those directed at the industrial sector), and U.S. supplies.

- . Perceived importance of the source: purchasers will tend to pay a higher price for sources they consider to be important - those that supply larger and reliable volumes. Municipal programs have generally been considered unreliable and marginal in the past.
- . The proximity of the U.S. and the availability of large quantities of paper supply should not be underestimated.

3. Decision to Provide Assistance/Incentives to Programs

There are a number of actors who have and/or could provide economic and other kinds of assistance to these programs.

Municipalities

The municipality may be willing to pay for a source separation program to operate in the collection area. There are two factors that will influence it to do so:

- . Perceived economic benefits -- primarily savings in disposal and collection
- . Perceived political pressure
- . Attitude of the municipality, especially municipal officials, to the program.

Provincial Government

Waste management: the Ministry of the Environment provides a range of support functions including its current subsidy program for multi-material source separation activities. It can also use other regulatory levers to help induce private sector and municipalities to provide (more) funds to these programs.

- . Job creation: Via its job creation programs, the province funds a number of source separation programs throughout the province. They qualify for assistance based on the job creation and specialized training characteristics of these programs.

The major factors influencing the provincial government are:

- . Overall policy considerations
- . Perceived political pressure.

Federal Government

- . Job creation programs: currently providing funds to a number of source separation programs in the province.
- . Environmental: the Department of the Environment has programs for research and development and provision of information in the recycling area.

As in the case of the province, the main factors influencing the federal government are overall policy considerations and perceived political climate. However, since the federal government does not have responsibility for waste management, its environmental policy concerns are somewhat different than those of the province. They tend to be more directed at and oriented to overriding environmental benefits.

Private Sector

- . Currently, there are a number of packaging manufacturers and related interests who are quite keen on getting access to the Ontario market. They have indicated an interest and willingness to contribute funds to source separation efforts in Ontario in order to be granted access to the Ontario market for the packages.

Public

The public is not a direct actor in any of these decisions but helps create the climate within which the other actors operate. Public opinion has been perceived to be willing in many instances to support source separation activities.

The initiative for source separation programs has to come from one of the proponent groups. A catalyst is required. These programs (with the exception of single material news collection when prices are high) have not been perceived in the past as particularly profitable.

However, the initiatory force for multi-material programs has been a combination of:

- . environmental concern (voluntary groups)
- . interest in obtaining other objectives such as job training and employment for handicapped and disadvantaged (for private sector third party)
- . the availability of government grants for this kind of activity
- . the municipality's feeling pressure from environmental consciousness and increasing solid waste problems.

More recently, waste management companies perceiving potential business advantages to engaging these programs have also provided a major catalytic push.

To be sustainable in the longer term, these programs must be economically viable. It is essential for programs in the province to be placed on a sound economic footing if they are to play the role that they are capable of in the solid waste management system.

Success Factors

1. A project proponent actively interested in undertaking a source separation program.

- . The catalyst: someone who sees the potential of these programs and who is willing to take on the risks that these programs entail.

In the past these people have been difficult to locate for multi-material programs.

The factors influencing the availability and dynamism of the catalytic role are:

- . General level of awareness of these programs and commitment to them (a lot of these programs started in the early 1970's).
- . Economics -- the success of other programs and the availability of money from the actors identified above.
- . For sustainability: the need to perceive a long term future in the business.

2. A municipality willing to permit the proponent to undertake the project.

- . Municipal approval is required to access the waste stream. Obtaining this approval can be a problem if the municipality perceives the program will create difficulties for it rather than benefits. Reliability of the operator is the key concern.

- . Municipal interest is a function of a number of factors discussed above.
- . Municipal endorsement is usually necessary to make the programs work effectively.

3. Economic incentive sufficient to satisfy the proponent.

Multi-material programs have not shown long-term economic viability without municipal payments or other outside sources of funds. The provincial government plan has been an important source of support for these programs.

Factors/Barriers

- . Prices:
 - Too low
 - Too uncertain (price fluctuations).
- . Participation rates:
 - High rates are important for economic performance
 - Motivation critical
- . Lack of municipal interest/willingness
- . In the past (and in the present for many municipalities), municipal officials perceived a high cost and low return for the solid waste system and a low political return for them. This appears to be changing with staff attitudes and the increased difficulty of obtaining landfill. Indeed, source separation is almost becoming a political necessity in communities passing through the Environmental Assessment process for landfill acquisition.
- . The municipality may now view a source separation program as one way of obtaining approval to acquire landfill. Other benefits for the municipality are:

- political plus for being associated with program
 - education of constituents re: costs of waste management.
- . Degree of municipal support important for operator:
- anti-screening by-law establishment and enforcement to protect waste stream
 - exclusive rights to designated operator
 - help with promotion.
- . Cost performance
- Improved economic performance of systems is essential.
 - Trends in this direction include:
 - . Single driver trucks
 - . More sophisticated materials handling, sorting and upgrading equipment and techniques
 - . Note this will decrease program suitability for other private sector actors mentioned above -- namely those who use these programs to train the handicapped.

The Major Forces Pushing in the Direction of Increased Multi-Material Separation Programs

The major forces pushing in the direction of increased source separation:

1. Public concerns

- . General public consciousness about environmental issues has increased: waste management is now a major issue.

- . Opposition to landfill: The public's attitude against the spread of landfill is a combination of:
 - Local concerns with the inconvenience caused by landfill.
 - A concern to preserve land use for non-waste activities.
 - The conception that there is "a better way" -- the other side of the increased public's consciousness about environmental issues.
- 2. Successful programs demonstrating technical viability, participation rates and integration with overall waste management system.
 - . A number of programs have demonstrated that from a technical point of view they perform in reducing solid waste.
 - . The Ministry of Environment's program has been important in showing this to date.
- 3. The need to acquire new landfill.
 - . A number of municipalities and regional municipalities who are in the process of acquiring new landfill; several more will be facing a decision in the next 5 years.
 - . Increasing costs of landfill: proximity, regulations and the environmental assessment process.
- 4. Regulatory process requirements.
 - . EA process and its requirements

- provide a focus for latent public concerns; opens up municipal decision-making to more extensive scrutiny
 - . More stringent requirements for landfill performance
 - . Increased necessity to explicitly consider alternatives, including source separation.
5. Increased interest of solid waste management companies in source separation.
 6. Interest of packagers in becoming involved with recycling, given government's proposed changes in packaging legislation.

All of these have resulted in:

- . The beginnings of a band-wagon effect. Municipalities are coming under increasing pressure from the public and are themselves taking more initiative in the direction of source separation.
- . Willingness of some municipalities to pay a premium for source separation, e.g., Kitchener. Long-term contracts with solid waste management companies integrating traditional waste management practices and source separation have appeared. The key motivation may be to "buy" a landfill by including source separation as part of a waste management package.
- . Proposals on the part of industry to put considerable funds into source separation.
- . The appearance of municipal contracts for solid waste management requiring a source separation program. Mississauga has issued tenders for such a contract.

It may be that there is enough momentum now to significantly increase the number of municipalities engaging in multi-material programs. This could eventually result in a province-wide system with multi-material recycling in most municipalities. It would be a high cost system if it performs in the way the current system does, relying as it does on money from provincial governments and/or municipalities and/or the private sector.

There are a number of concerns about this. If put in place under heavy subsidy, will it be viable over the longer term without a continuation of this subsidy? It is important to note that the stakes are relatively high in political terms. The risk of failure of these programs becomes much higher once the systems extend across the province. Once it is in place, there will be intense pressure to keep it going; the province must be clear on this -- it must be willing to do what is necessary to keep the program going or be willing to take the stance that it is "all right" if the system goes under -- some time in the future.

A number of important concerns emerge: municipal willingness to pay, program economics and markets for recovered materials.

1. Continued willingness of municipalities to pay a premium for these services.

- . How long will this willingness last? Some of this willingness is aroused directly by the process of landfill acquisition. Will municipal commitment last beyond this initial phase? One significant countermove seems to be the signing of long-term contracts by the waste management companies.

2. Economics of the Programs

Data for the technical performance and cost of these programs has been derived from information submitted to the Ministry of the Environment on grant applications. The information for the most mature of these programs has been averaged and used as a base case. The base data is included in Table S1.

Figure S1 presents the results of an analysis varying the diversion credit. It shows the loss per ton for different diversion credits. According to current figures based on prevailing market conditions, these programs are not economically viable without a significant credit. Based on current diversion credits of about \$5 (eg., \$4.40 for Peel) the programs need about \$10/ton grant (\$9 tonne).

These projects are particularly sensitive to market fluctuations. News is the largest revenue item. Figure S2 shows the impact of variations in the price of news on annual program loss. The base case price is \$61 (\$55/tonne). The low price of \$15/ton (\$14/tonne) is a recently quoted figure for the output of the proposed Mississauga program. At this price, the program would need over \$40/ton (\$36/tonne) diversion credit to break even.

How reliable are the economic data for the programs? It may be true that the programs can perform better than these figures indicate. With the view to making these programs more economically resilient and decreasing the necessity for long term subsidy, it is important to:

- . encourage improved program cost performance.
- . modify the programs to the extent possible in order to incorporate more sources of revenue -- the addition of the aluminum can, for example, would be an important revenue supplement.
- . develop alternative markets for secondary materials.

Table S1

Source Separation Input Assumption

Materials Price: \$/ton

News	\$ 61
Glass	\$ 32
Metal	\$ 66
Corrugated	\$ 78
High Grade Paper	\$127
Price Increase:	Inflation Rate

Composition of Average Ton Recovered

News	57%
Glass	20%
Metal	4%
Corrugated	12%
High Grade Paper	7%

Labour Related

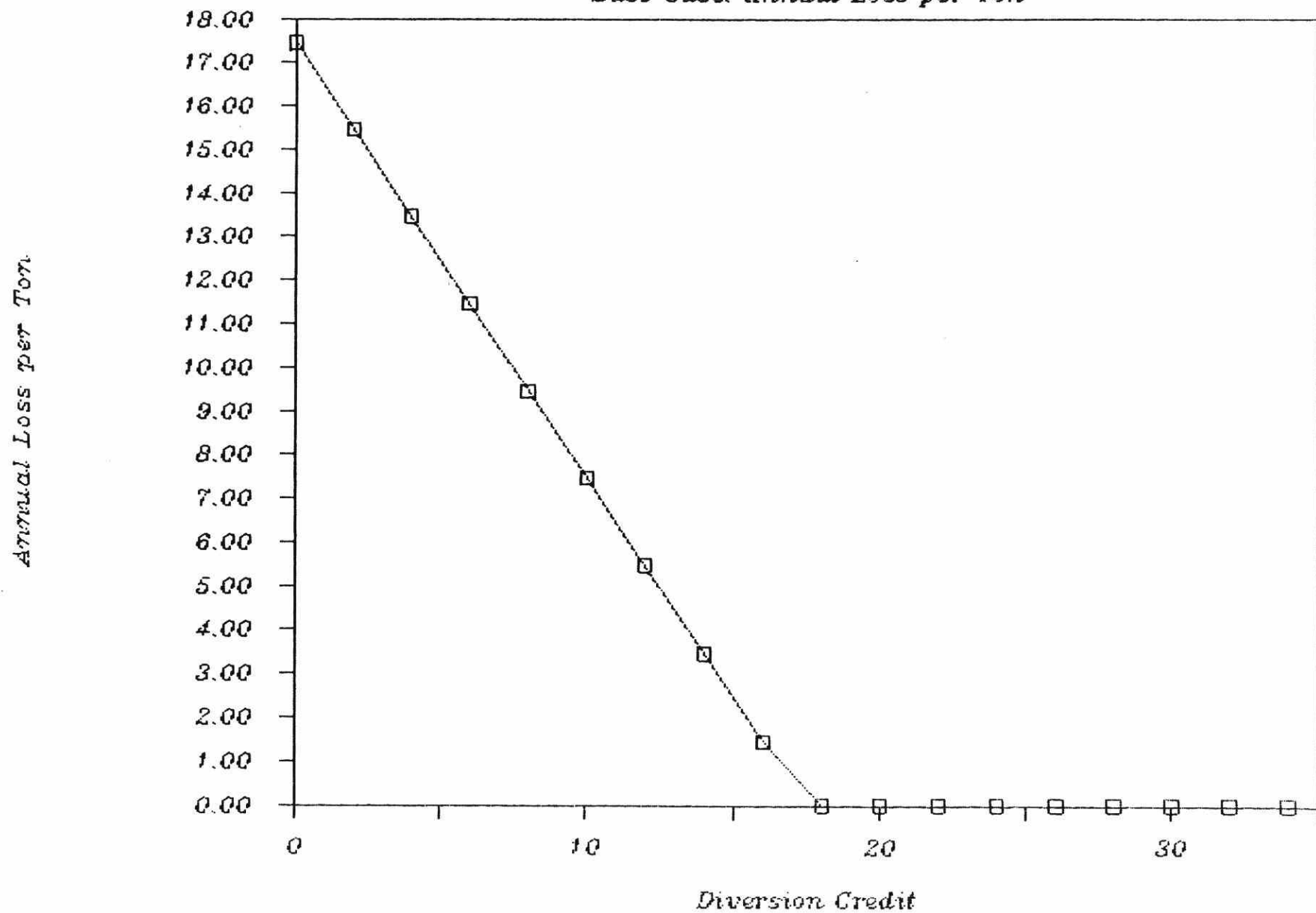
Wages & Fringes/Hour:	\$8
Tons Recovered/Hour:	.25
Wages & Fringes/Ton Recovered:	\$32

Other Costs/Ton

Administration	\$13
Other	\$26
Buy Back	\$11

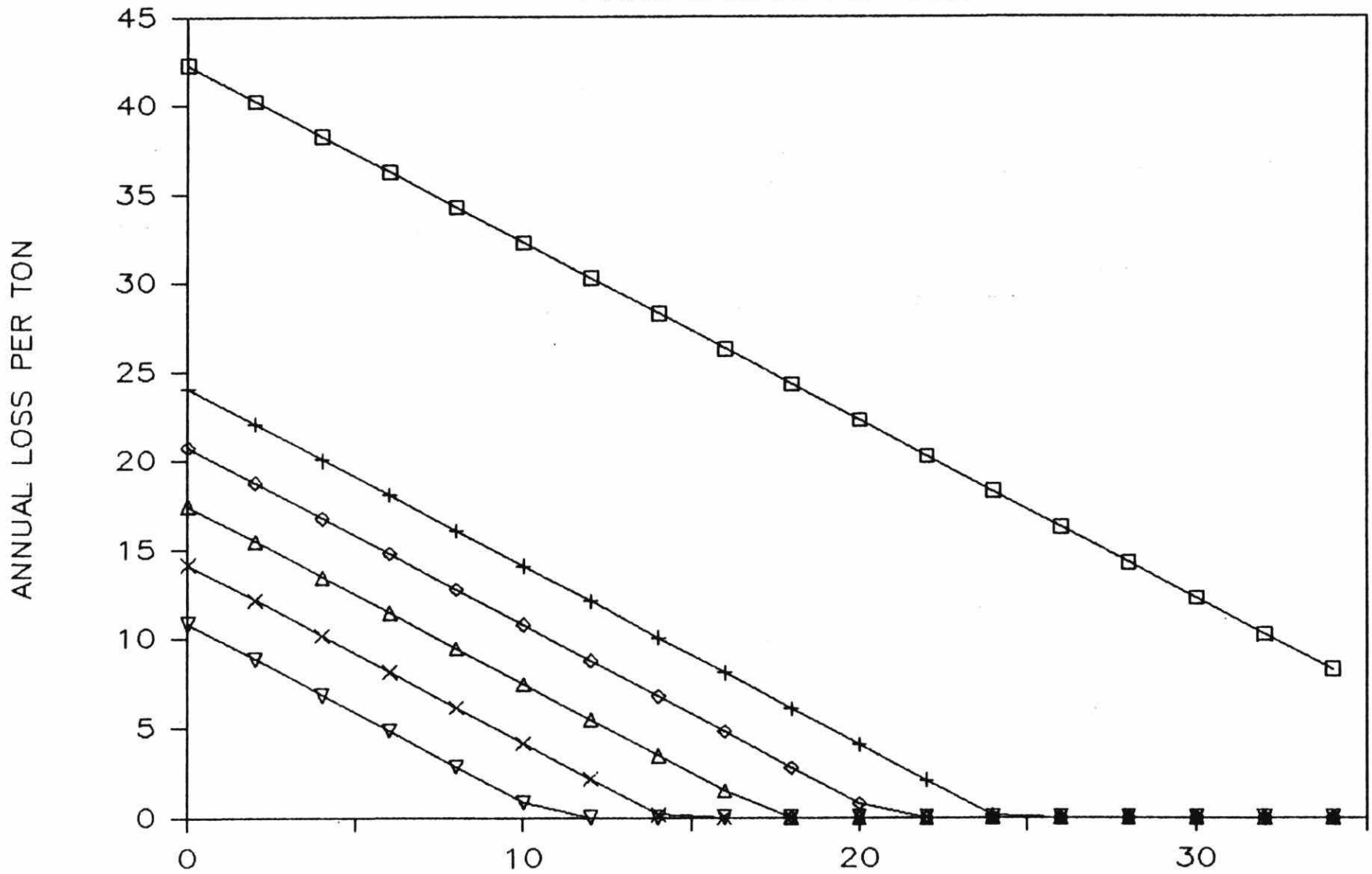
SOURCE SEPARATION: IMPACT OF CREDIT

Base Case: Annual Loss per Ton



IMPACT OF CHANGES IN NEWSPRINT PRICE

ANNUAL LOSS PER TON



News Prices at:

- ▽ \$73
- X \$67
- △ \$61 (Base Case)
- ◇ \$55
- + \$49
- \$15

Diversion Credit

3. Markets for Source Separated Materials

Newspaper

While a number of assorted paper manufacturers such as Belkin and Strathcona and some cellulosic insulation manufacturers are important parts of the market, the major force is Ontario Paper. It has established a network of regional dealers throughout the province.

Currently news prices are in the \$60 - \$65 per ton (\$54 to \$59 per tonne) range baled (f.o.b. recycler's yard).*

The future demand for old newspapers is expected to be strong.

Glass

Domglass and Consumers' Glass are the two major end-users of glass in the province. Prices vary for mixed glass between \$30 and \$50 a ton (\$27 and \$45 per tonne).

Metal

The formation of the Canadian Tinsplate Recycling Council, which represents Stelco and Dofasco, has represented a major development in the market. Lately, the market has been much stronger than it has been historically. Current prices are approximately \$70 a ton (\$63/tonne) for mixed cans (minimum half ton).

Old Corrugated Containers

The major consumers are Southern Ontario boxboard and corrugated medium manufacturers -- Domtar, Atlantic Packaging, Trent Valley Paperboard, etc.

*They may have changed dramatically quite recently. The price offered for the projected output for the proposed Mississauga program was \$15/ton (\$14/tonne).

The current price is in the \$60 - \$75 per ton (\$54 to \$68 per tonne) range baled (f.o.b. recycler's yard). The future market is expected to be strong.

Fine Paper

Major purchasers in Southern Ontario are Strathcona, Fraser Paper, Kimberly Clark and Atlantic Packaging. Prices vary with quality of paper between \$175 (for coloured manifold ledger) and \$330 for manila tab cards. The future market demand is expected to be strong.

Other Markets - Aluminum, PET and Waste Oil

It has been suggested that with the alteration of container legislation, other materials may constitute an important component of the wastestream. Aluminum beverage containers, for example, could be expected to bring about \$900 a ton (\$816/tonne) (f.o.b. recycler's yard). PET containers could bring about \$240 a ton (\$218/tonne). The market for waste oil has recently weakened significantly.

Strategic Considerations

The key market issue is paper. It appeared that the building of the Ontario Paper de-inking facility in Thorold would solve the long-term paper market problems. To a certain extent this has been true. However, the company continues to rely on the United States for approximately half of its supply.* More importantly, perhaps, because of the lack of diversity of the market for news, the future of source separation in Ontario may be tied directly to the fortunes of one company.

What occurs if there are major problems with Ontario Paper's operation? Major episodic fluctuations or the demise of the company (for which, thankfully, there is no current evidence) would severely affect the fortunes

*Back haul opportunities from its newsprint shipments to Chicago and elsewhere, attractive prices and U.S. community pressure to take a portion of the waste its products create are the prime reasons.

of source separation programs in Ontario. More relevantly perhaps: what impact will the source separation system tied to the proposed soft drink container regulation have on markets? With a captive system which will be propped up at almost "whatever the cost" by packagers and/or government, Ontario Paper is in the position to make the most of the situation economically.

This underlines the need to diversify source separation markets, especially paper. The more materials that are included and the more purchasers of these materials become part of the market, the more likely it is that source separation's future will be guaranteed.

Stakes become quite high with a major extension of multi-material source separation programs. A repetition of the 1974-1975 downturn (or the more recent downturns in the early 1980's) could jeopardize what could become a central component in the province's solid waste management system.

4. Participation Rates

Participation rates have been shown to be quite high for some of the programs run in the province -- for example, the Kitchener program. High participation rates are important for the economic performance of these programs. However, the long-term performance of these "state-of-the-art" programs has yet to be proven. While it can be argued that participation over the longer term should be just as high if not higher than what has been attained by these programs, this kind of high performance has not been demonstrated -- the programs have not been in existence long enough to show that these can be sustained.

These programs rely on the commitment of the householder. This commitment stems largely from the householder's understanding that these problems are a "good thing". Will the fact that these programs are recycling "for profit" for the companies involved mitigate participation? This has not been the case in Kitchener. However, this might emerge as an issue, especially if the public perceives these programs to be heavily subsidized.

Mandatory participation may be a requirement, especially if other components of these programs' cost performance fail to improve and/or markets are not sustained.

POSSIBLE GOVERNMENT INITIATIVES

It is difficult to say what the true economics of these programs are; but it is clear that without external contributions above and beyond avoided cost by the municipality, it is unlikely that these programs will be sustainable past the grant period. Consequently, these programs need assistance in raising revenues and/or decreasing costs.

A. Revenue-Related Effects

1. Encourage/induce funding from other sources:

1.1 Heighten municipalities willingness to pay by:

- . Increasing cost of landfill
- . Increasing difficulty of acquiring landfill
- . Helping heighten and focus public consciousness of the issue on municipal decision-makers
- . Encouraging a municipal attitude change.

Specific Measures To Do This Could Include:

- . Further tightening of the Environmental Assessment regulations; more rigorous requirements
 - implementation of perpetual care requirements.

- . Ensure continuation of public participation requirements around EA and landfill acquisition to increase pressure on public officials
- . Exhortation and moral suasion directed at municipal decision makers
- . Education of municipal officials
- . Provincial grant leverage to induce a municipal commitment -- e.g., a matching grant linked directly to the premium a municipality pays over and above its avoided landfill costs.

1.2 Private Sector Willingness to Pay

- . Use package regulations to encourage participation by packaging industry

1.3 Encourage Other Government Bodies

- . Encourage Ontario government Ministries to continue and enhance level of support for funding of these programs.
- . Explore further initiatives with the federal government.

2. Allow Introduction of Other Containers; Encourage Other Program Elements

As has been argued extensively by the Recycling Support Council of Ontario and others, allowing the addition of new soft drink packaging materials in Ontario could help the economics of source separation programs. The analysis indicated below suggests that this could be the case.

- . Aluminum to the wastestream
- . Possible plastics into the wastestream*

3. Direct Provincial Grants and Provincial Funding

- . Capital grants: multi-material systems, especially those that are efficiently run, require more capital than they previously did; consequently, capital-based grant might be the most appropriate approach.
- . Operating grants: the current Ministry's program is based on funding of program losses. This approach has the problem that it does not encourage cost-effective performance. It may be better to base operating grants on performance (see detailed discussion below).
- . Tax-based incentives.

All the above could be financed from Environment's budget or could be levied using a landfill surtax.

- . Waste

4. Market Development

- . The Government of Ontario must look seriously at this problem. It may be lulled into a sense of security over the seemingly high performance and lack of problems in the current situation. The market has improved but still is potentially precarious over the medium and long term, with a heavy dependence on the economic fortunes of just a few companies.

*Plastics are the fastest growing component of the waste stream. The initiative to begin recovering the plastics, with attendant market development, could be critical for the long-term recycling picture in Ontario.

With the expansion of recovered news that may take place, the market could be in serious over-supply, with attendant falling prices. Apart from news, the plastics and waste oil markets also deserve attention. The new soft drink containers may exacerbate the problem significantly.

A number of initiatives need to be carefully considered:

- . Encouragement of import substitution by industries currently using recovered materials from the U.S.
- . Encouragement of substitution for virgin fibre in existing operations (e.g., up to 5% in newsprint mills) -- this deserves special attention because of the potential major impact on news use. The primary focus should be on newspaper markets.
- . Encouragement of the establishment of new plants using recovered materials.
- . Encouragement of research into new uses.
- . New uses or more commitment to local based sources of supply or markets moving through encouragement or creation of buffer stocking schemes to help stabilize markets.
- . Work more closely with the federal government in developing markets.

B. Cost-Related Initiatives

1. Encourage Cost Minimization

There are a variety of ways of doing this. The first is to gear revenue-related initiatives so that they encourage cost performance. The

present approach of funding losses does not directly encourage improved cost performance.

One way of approaching this is a tonnage-based grant which would permit operators to cost minimize without any penalty in terms of decreased grant. This grant could be matched to a municipal contribution to encourage high participation -- perhaps based on the municipality's willingness to pay a premium.

2. Encourage Introduction of Innovative Techniques

- . R&D on collection and handling equipment
- . Demonstrate innovative techniques -- collection, handling and marketing

Changes in the waste stream -- e.g., the increase in plastics composition -- present significant challenges for future source separation programs. The difficulties involved with the cost-effective recovery of plastics are one obvious example of the need for continued support of the development and demonstration of innovative techniques. The Ministry can continue its approach of supporting promising initiatives in this area.

3. Decrease Set-up and Operating Costs by Simplifying Institutional Arrangements

- . Make collection/disposal part of the same jurisdiction -- have the regional municipalities in charge of the collection, as well as the disposal, of solid waste. As noted previously, this amalgamation could have a negative effect on recycling if it eliminated the existing economic incentive which many municipalities have of saving the full tipping fee.

APPENDIX 6

ASSESSMENT FRAMEWORKS AND THE PROVINCIAL PERSPECTIVE

APPENDIX 6

ASSESSMENT FRAMEWORKS AND THE PROVINCIAL PERSPECTIVE

6.0 Introduction

As described in Appendix 7, a number of tools have been created to assist the Ontario government in estimating the impact -- economic effects, jobs created, materials diverted from landfill, energy saved, etc. -- of increasing EFW and source separation.

How can the benefits of increasing the implementation of the 4Rs be assessed from the provincial perspective?

6.1 What are the Impacts of EFW and Source Separation?

There are two primary impacts:

- . Saved landfill
 - Economic costs
 - The environmental impact
 - Social impact
- . Reclaimed resources
 - Make resources available for reuse
 - Economic costs
 - Environment impacts
 - Social impact.

6.2 How are Decisions About Alternatives Made?

Others things equal, decisions about whether to engage in EFW or source separation are made on economic grounds. For a source separation or EFW program, the proponent will decide to engaged in the activity if:

$$TC = \sum_{t=0}^Y \frac{S_t - PK_t - PO_t + PTF_t + POT_t}{(1 + r)^t}$$

Where,

TC = Present Value of Net Costs of Technology X to the Proponent

S_t = Sales in year t Related to Technology X

PK_t = Capital Cost to Proponent in year t

PO_t = Operating Cost to Proponent in year t

PTF_t = Tipping Fee (Diversion Credit) paid to Proponent year t

POT_t = Other Revenue Flowing to Proponent in year t

r = Proponent's Discount Rate (hurdle rate of return)

Y = Time Period over which Proponent Evaluates Projects

6.3 What is Wrong with These Decisions?

If the true value of the social, environmental and other impacts are reflected in these decisions, then there is no prima facie argument for government intervention to improve decision making. EFW or source separation will be implemented where it makes sense. However, it is often argued that the province should support EFW or source separation because they:

- . Provide jobs
- . Save material resources
- . Save energy resources
- . Avoid the environmental impact of landfill
- . Save land that would otherwise go to landfill.

- . Contribute to the development of a conserver ethic*.

That is, the argument goes, these impacts are not properly accounted for in the individual decisions made -- the landfill is underpriced, the employment generating potential is not accounted for, etc.

6.4 An Analytical Framework

A computer model has been prepared to enable the Ontario government to assess these impacts, using a benefit cost framework by changing some of the key values. The model is based on the following approach. The value of diverting one ton of solid waste from landfill is:

$$DDC - IDB$$

Where DDC = Direct Dollar Cost

IDB = Indirect Dollar Benefit.

Direct Dollar Cost

The Direct Dollar Cost is formulated as the dollar cost associated with processing one tonne of solid waste using technology X. It is expressed as:

$$DDC = \sum_{t=0}^N \frac{K_t + OC_t - R_t}{(1 + d)^t}$$

Where,

DDC = Direct Dollar Cost

K_t = Capital Cost, year t

OC_t = Operating Cost, year t

$$= L_t + F_t + M_t$$

*Source separation, reduction and reuse behaviour may do this.

Where,

L_t = Labour Cost, year_t
(Shadow priced, where appropriate, to reflect
social cost for specific types of labour)

F_t = Fuel Cost, year_t
(Shadow priced, where appropriate, to reflect
the social value of energy savings)

M_t = All Other Operating Costs

R_t = Revenues, year_t
(Shadow priced, in the case of reclaimed
materials, to reflect social opportunity cost)

d = Social Discount Rate

t = Time Horizon for Social Costing Purposes,
reflecting lifetime of longest-lived capital
investment of any of the alternatives to
landfill (eg, 20 years for an energy from waste
facility).

Indirect Dollar Benefit

The indirect dollar benefit is the dollar savings associated with the decreased solid waste management requirements resulting from processing one tonne of solid waste by alternative technology X. The first point to note is that processing one tonne of solid waste using technology X does not always reduce solid waste management requirements by one tonne. EFW, for example, leaves a residue of about 20% by weight for each tonne processed.

The second point to note is that this calculation is done by using a two part "before and after" approach, which takes into account the scale of the implementation of technology X - the number of tonnes processed. That is,

$$IDB = \frac{SWCB - SWCA}{TD}$$

Where,

IDB = Indirect Dollar Benefits per Tonne of Solid Waste Processed

SWCB = Solid Waste Management Costs Before the Implementation of Technology X

SWCA = Solid Waste Management Costs After the Implementation of Technology X

TD = Tonnes of Solid Waste Decreased as a Result of the Implementation of Technology X

$$= TP * (1 - C)$$

Where,

TP = Tonnes of Solid Waste Processed as a Result of Implementing Technology X

C = Residue Left to be Disposed of After Processing 1 Tonne of Solid Waste Using Technology X

The cost components include:

- . solid waste collection
- . solid waste transportation
- . landfill operation
 - site maintenance
 - leachate removal
 - other landfill operating costs
- . perpetual care
- . acquisition
 - land costs
 - approvals costs

$$\begin{aligned} \text{eg, SWCB} &= \sum_{t=0}^N \frac{SCB_t + SWTB_t + SMB_t + LRB_t}{(1 + d)_t} \\ &+ \sum_{t=0}^N \frac{OLB_t + PCB_t + LCB_t + LAB_t + OAB_t}{(1 + d)_t} \end{aligned}$$

Where,

SCB_t = Solid Waste Collection Costs Before Implementation of Technology X

$SWTB_t$ = Solid Waste Transportation Costs Before Implementation of Technology X

SMB_t = Site Maintenance Costs Before Implementation of Technology X

LRB_t = Leachate Removal Before Implementation of Technology X

OLB_t = Other Landfill Operating Costs Before Implementation of Technology X

PCB_t = Perpetual Care Before Implementation of Technology X

LCB_t = Land Costs Before Implementation of Technology X

LAB_t = Landfill Approval Costs Before Implementation of Technology X

OAB_t = Other Landfill Acquisition Costs Before Implementation of Technology X

The same cost elements are included for SWCA, the only difference being the costs are calculated after the implementation of solid waste alternative technique X.

6.5 What About Jobs Created?

In the framework above, the unemployed labour value is taken into account by using a shadow price for labour. The user specifies that shadow price.

An alternative kind of argument is often made without reference to this approach, namely that an alternative should be subsidized by government simply because it creates jobs. But any subsidized expenditure creates jobs. What has to be demonstrated is that the project creates net jobs -- more jobs than would have been created had the money been spent on other candidate projects.

There are two problems with this approach. First of all, the analytical tools available to make these assessments are very crude. It is difficult to trace through job impacts unambiguously in the comparison of two alternatives. Secondly, differences in jobs often relate primarily to wage rates paid -- lower wage rates yield more jobs.

The major difference in job creation impact for each dollar spent often depends upon the commercialization potential of the project involved. Options with a potential to be self-sustaining after an initial period of government subsidy are much more attractive in this regard.

It is sometimes argued that source separation should receive special attention because it can offer employment to the handicapped*. Should it be given a special subsidy on this account? The value which the government places on employment to the handicapped is, in part at least, accounted for by the training and related subsidies available to those who employ the handicapped. This effect would be incorporated in the economic evaluation of the project because it is contained in the wage rate paid. Only that social value of the handicapped employment not captured by this subsidy should be considered a separate benefit.

6.6 What About Material and Energy Savings?

In the framework developed, the mispricing of reclaimed materials and energy can be corrected by shadow pricing each or both. This allows the

*It appears that most of the jobs will relate to inside processing and upgrading activities -- work on collection vehicles appears to be ruled out for the handicapped in some applications.

user to make adjustments in the benefit cost assessment by entering a premium for energy and for materials prices.

Fossil fuel energy savings may be underpriced because they fail to reflect the energy security value of indigenous energy sources. Reclaimed materials may be underpriced because of special subsidies which virgin materials receive* or because of market imperfections. On these grounds then, it could be argued that EFW plants and source separation should receive a subsidy to correct for this mispricing.

6.7 What About the Environmental Benefits of Source Separation and EFW?

It is frequently argued that EFW and source separation avoid the environmental impacts of landfill and are thus environmentally preferable and should receive Ontario government financial support in this regard.

The Ontario government sets environmental standards by which landfills and EFW plants** have to abide. Each landfill which receives approval under the EPA is considered environmentally acceptable by the Ontario government; so too is any EFW plant which obtains a Certificate of Approval.

Each application is considered approved or not approved on the basis of its ability to meet the regulations. Therefore, the trade-off between the air emissions and ash disposal environmental impacts of EFW on the one hand and the leachate impacts of landfill on the other hand are implicitly considered equal for any approved landfill or EFW plant. The Ontario government's approach to standard setting is based upon a "no impact" philosophy. Consequently, the nature of Ontario's approvals process makes it difficult for the province to give blanket

*Special tax concessions, free government forestry support services, etc.

**Implicitly, all of the activities involved with source separation.

environmental favour to one or the other and justify economic support on these grounds.

It should be pointed out that, in any case, it is difficult to assess the net impact of either source separation or EFW -- little information currently exists on the net leachate impacts of diverting quantities of refuse to source separation or EFW.*

6.8 What About the Spill-Over Effects of Source Separation on Consumers' Attitudes?

It has been suggested that involving the householder in source separation increases environment consciousness and encourages conserving behaviour in other spheres of activity.** This impact has not been included in the framework, and should be added to the effects. The magnitude and value of the effect is very difficult to quantify.

6.9 What About the Underpricing of Landfill and Associated Negative Social Impacts?

Should not EFW and source separation be given ongoing Ontario governmental support because of the negative impacts of landfill?

There are two primary considerations involved in this question. The first is that the impacts are highly site specific. The second is that the process already established for assessing landfill already takes these effects into account, however imperfectly (EA & EPA approval).

Thus, there are two sides to the argument. On the one hand, because of the site specific nature of the impacts, it is difficult to develop a

*Including the landfill of the ash.

**Energy conservation is often cited. Attitudes toward other waste reduction activities may be changed as well. The response to the home composting program in Kitchener was far greater after households had participated in the source separation program than before it was initiated.

provincial subsidy or grant program to EFW and/or source separation which takes into account local conditions. Thus there is an argument for changing the process at the local level. However, for a variety of reasons, this may be impractical.

Should the process be changed to make landfill approval requirements more stringent, or should alternatives to landfill be encouraged? The section which follows examines each of the concerns expressed about landfill's impact, discusses how the impact is currently factored into the decision-making process, examines the possible concern with the current approach, discusses the possible direct mitigating measures available via a process change, and concludes by examining how encouraging the 4Rs might help in addressing them.

Impacts and Decision Making

1. Landfill

The municipality's decision to acquire landfill or to expand existing landfill typically requires EA approval. The decision is also open to public scrutiny as are other decisions made by council (e.g., through council meetings).

Impact 1.

Landfill takes up land which has other possible productive uses.

How Impact Is Currently Factored Into Decision-Making

- i) Local zoning regulations constrain use of land.
- ii) Price of land embodies value of alternative uses.
- iii) Through intervention in EA process local citizens can make views known about the land use in question.

- iv) Through intervention at Council those affected can make their views known about the appropriateness of use.
- v) Ontario's Foodland Guidelines suggest restrictions on the use of agricultural land to be considered by Council, EA, etc.

Possible Concern with Current Approach

- i) Zoning may not be adequate.
- ii) Land prices may not be high enough to reflect true value of the land in alternative uses.
- iii) Expropriation procedures may not give fair price.
- iv) Appeal procedures through courts may not give proper redress - may be costly, time consuming and ineffective.
- v) Foodland Guidelines do not have any mandatory effect.

Possible Direct Mitigating Measures

- a) Council (OMB) land rezoning.
- b) Have EAB or Consolidated Board require proponent to employ a costing methodology which embodies true cost of land in alternative uses, so that market price not necessarily used as criterion in deciding between alternatives.
- c) Alter nature of expropriation and/or appeal procedures.
- d) Strengthen Foodland Guidelines.

How Encouraging the 4Rs Might Help

Note: the direct mitigating measures would encourage the use of the 4Rs by making landfill more expensive.

An alternative approach, would subsidize 4Rs (EFW and/or Source Separation) to the extent warranted by the underpricing of the landfill. This would increase attractiveness of the 4Rs and, if properly considered in the EA process, could lead to an increase in 4Rs implementation.

Problem: this impact is site specific and it is difficult to identify a generalized 4Rs credit which can embody this effect. Consequently it is difficult to set at a province wide level.

Impact 2.

Landfill has a negative effect on surrounding land uses and on the quality of life of the residents in the immediate area.

How Impact Is Currently Factored Into Decision-Making

- i) Local zoning regulations constrain use of land.
- ii) Through intervention in EA process local citizens can make views known about the impacts on surrounding land.
- iii) Through intervention at Council those affected can make their views known (e.g., Peel and Markborough's intervention).
- iv) Appeal of decision can be made.
- v) Compensation can be awarded.

Possible Concern with Current Approach

- i) Zoning may not be adequate.
- ii) EA decision making process may not take these impacts into account.
- iii) Appeal procedures through courts may not give proper redress.
- iv) Compensation provisions inadequate - may not make adequate award.
- v) Council listens only if there is a significant political lobby.

Possible Direct Mitigating Measure

- a) Council (OMB) land rezoning.
- b) Have EAB or Consolidated Board require a methodology which does a benefit-cost or similar kind of analysis of external effects of the landfill acquisition on surrounding property.
- c) Alter nature of expropriation and/or appeal procedures.
- d) Change approach to compensation.

How Encouraging the 4Rs Might Help

As in the case of Impact 1, the use of direct mitigating measures would encourage the use of the 4Rs by making landfill more expensive.

An alternative approach, would subsidize 4Rs in direct proportion to the underpricing of the landfill. This would increase attractiveness of the 4Rs and, if properly considered in the EA process, could lead to an increase in 4Rs implementation. Note, however, that since landfill is required in any case, the negative effects which result from any

landfill acquisition, will still affect flow to those who should be compensated, unless direct mitigating measures are made.

Problem: this impact is also site specific and it is difficult to identify a generalized 4Rs credit which can reflect this uniformly across the province.

Impact 3.

Landfill generates leachate. Leachate with organics and heavy metals can intrude into local water supplies, contaminating the environment and potentially affecting human health. Leachate containing exotic substances such as dioxins is of special concern because of long term carcinogenic and other effects.

Leachate can continue for several (hundred of) years after site has finished useful life.

How Impact Is Currently Factored Into Decision-Making

- i) Landfill must satisfy EPA requirements. EAB must be convinced that design and operations will be environmentally acceptable.
- ii) Through intervention in the EA process local citizens can express concerns about leachate's impacts, call witnesses, etc.
- iii) Intervention can be made at local Council.
- iv) EA decision can be appealed.

Possible Concern with Current Approach

- i) The Ministry's standards and guidelines regarding acceptable levels of contamination may be insufficiently stringent. Environmental impacts, including the effect on water supplies,

which are considered acceptable today by the Ministry may be found to be unacceptable in the future. This would render water supplies unfit and/or necessitate remedial measures. Environmental quality and/or human health would suffer as a result.

- ii) The Ministry's methods for determining the performance of the landfill - i.e., for estimating the effectiveness with which the design will keep the landfill's leachate within Ministry standards and guidelines - may be inadequate. The result may be much higher levels of contamination than predicted, exceeding Ministry's standards. Environmental quality and/or human health could suffer as a result.
- iii) The Ministry's approach to monitoring performance may be inadequate. Leachate is harder to monitor than air emissions, for example, and even the best intentions and performance by the Ministry may be insufficient to ensure environmental quality.
- iv) The composition of solid waste is impossible to predict. Substances in municipal solid waste may generate leachate with characteristics which are particularly problematic (e.g., exotics), but which have not shown up to date in current tests. Thus even if Ministry standards are adequate and the methodology for predicting plume behaviour is satisfactory, leachate may cause future, unanticipated problems.
- v) Because there is no necessity for municipalities to pay into a (perpetual care) fund to ensure that unanticipated future problems will be dealt with, there is no guarantee that future generations will not have to pay to remedy the problems created by current practices. This underprices current landfill and is morally questionable.

Possible Direct Mitigating Measures

- a) Make EPA standards and regulatory practices more stringent.
- b) Make standards and guidelines specifically relating to "exotics" more stringent.
- c) Increase monitoring frequency and quality.
- d) Institute perpetual care, to ensure ongoing monitoring, treatment, and remedial work, will be funded, where necessary.

All of the above will have the effect of making landfill more expensive and/or more difficult to obtain.

How Encouraging the 4Rs Might Help

Reduction, reuse and multi-material source separation decrease the quantity of materials going to landfill. Impact on leachate quantity and quality is less certain, depending upon what component of the waste is reduced, reused or recycled. For example, a multi-material source separation program should decrease the inorganic leachate component associated with ferrous materials and the organic leachate generated by the paper fraction. The overall impact on leachate quantity and quality, however, may be negligible. To the author's knowledge there is no comparative analysis available of leachate with and leachate without 4Rs implementation.

A source separation program directed at problematic components of the waste stream - e.g., waste oils, household hazardous wastes - could have a greater effect in dealing with leachate related concerns.

Centralized energy and material recovery's net impact on leachate depends upon what is done with the EFW ash. If the ash is landfilled,

then the organic component will decrease, but dioxin and other problematic contaminants may increase.

Consequently the net impact of the use of the 4Rs to address leachate concerns appears uncertain. It is an important information gap which hinders informed comparison of the impacts of the alternatives. It also makes it difficult to decide how much the 4Rs should be supported on this account.

Source separation, reduction, EFW and mechanical recovery also have environmental impacts. There are air and water emissions associated with EFW facilities. The increased use of collection vehicles increases air emissions for reuse and recycling. All of these can meet Ministry standards. But so can landfill.

Herein lies a key problem for Ministry environmental policy relating to the 4Rs. The Ministry's position appears to be that if a technology can meet its standards and guidelines, it is environmentally acceptable. Consequently since landfill, source separation, EFW and mechanical recovery can meet these standards they are all environmentally acceptable. Is there anything to choose between them environmentally? If so, what is it?

The Ministry appears to be faced with a choice. It can maintain its current position, in which case there is no environmental rationale to provide special support to the 4Rs. Or it can agree that there is an environmental plus, identify the nature of that plus (perhaps by doing a risk-benefit analysis) and use it as part of a rationale for ongoing support to one or more of the 4Rs.

APPENDIX 7

ANALYTICAL TOOLS DEVELOPED DURING PROJECT

APPENDIX 7

ANALYTICAL TOOLS DEVELOPED DURING PROJECT

The following is a list of computerized models and data files developed during the project leading up to the preparation of the interim report:

1. Evaluation Framework. A microcomputer model which provides a framework for comparing the costs of alternative solid waste management systems. It is based on a benefit cost approach, with provisions for varying assumptions concerning key variables. It is described in Appendix 6.
2. EFW Analysis. A model which analyzes the economic performance of EFW projects under a range of assumptions about strategically critical variables, for this project. Examples of model output are include in Appendix 6.
3. Source Separation 1. The Ministry of Environment data on multimaterial source separation projects was used to prepare a sample program for analytical purposes. Sample output is presented in Appendix 5.
4. Source Separation 2. A model developed to facilitate analysis of the impact on program performance of variations in key variables such as participation rates, waste quantities handled, distance to market, etc.
5. Waste Management Disposal Comparison. A model developed to evaluate the relative costs of alternative disposal options within a given jurisdiction. It is a variant of the evaluation framework (1 above).

6. Tipping Fee/Diversion Credit. A microcomputer model used to calculate Tipping Fees and Diversion Credits under a range of assumptions about key variables.
7. Landfill Database. A large portion of the Ministry of Environment's landfill inventory was manually transferred to microcomputer to facilitate the analysis of remaining landfill capacities in the province. Results are utilized in Chapter 2.
8. Waste Quantities and Flows in Ontario. Populations and household figures for each Ontario municipality have been combined in a model to enable the evaluation of the impact of different waste diversion options on waste flows in Ontario. A sample printout is included in the next page.

ANNEX 1

THE POSITIVE IMPACTS OF EFW AND SOURCE SEPARATION

ANNEX 1

The Positive Impacts of EFW and Source Separation

EFW projects reclaim energy from an indigenous Ontario resource and save the social and environmental impacts associated with the solid waste which they divert from landfill.* Source separation projects reclaim resources for recycling, save the social and environmental impacts associated with the waste they divert from landfill and involve Ontario householders and commercial/industrial operators in an activity which can promote other conserving behaviours. Reuse has the same kind of effect as recycling, without remanufacturing materials. Reduction, of course, is a pure saving activity -- all of the landfill effects are avoided and none of the production related effects incurred.

Do these impacts constitute the net benefits to the province of encouraging these technologies? There are three considerations which are central to this evaluation:

- . Many of the net impacts are highly site specific. The social impact savings of not landfilling waste differs markedly from site to site, depending on population proximity. The same is true for environmental impacts and economics.
- . The existing processes for deciding whether or not these projects should go ahead already factor in these considerations, more or less imperfectly.
- . Information on the nature of these impacts - eg. leachate impacts of diverting certain portions of the waste stream from landfill - is frequently imprecise or non-existent.

Thus it is difficult to identify the benefits to the province without closely examining the nature and weaknesses of the existing decision-making processes which determine whether or not the 4R process is implemented. The following can be concluded however:

Energy Benefits

EFW and RDF save fossil fuels. Resource recovery and source separation can save fossil fuels too, depending on the uses to which the recovered

* They also have air and water emissions and leachate impacts associated with the landfilled ash.

materials are put.* The benefit to the province is the quantity of fossil fuel energy saved times the energy security premium which is not reflected in the market price of fossil fuel. Reduction can save energy too

Environmental Benefits

EFW saves the air emissions and leachate associated with transporting and landfilling the diverted portion of the waste stream. It adds the leachate associated with landfill-disposed ash, as well as the air and water emissions from plant operation and waste and ash transportation. Source separation saves the air emissions and leachate associated with transporting the diverted portion to landfill and adds the emissions associated with source separated materials transportation and processing. Reduction saves all of the landfill-related environmental impacts and all of the impacts associated with manufacturing.

Are these a net plus or a net minus to the province? There are two difficulties associated with assessing this. The first is the already-mentioned site specificity of impact and imprecision of information.

The second is the manner in which the province administers environmental regulation. This is particularly important concern for adducing a provincial environmental benefit premium to landfill alternatives. The Ministry of the Environment sets environmental standards for landfills and EFW plants (and implicitly source separation programs). It uses a "no effect" criterion in establishing these standards and guidelines. On the basis of this approach any approved landfill or EFW facility approved is considered to be environmentally acceptable. Thus attributing an environmental premium to any of the alternatives appears to involve a basic contradiction in the Ministry's stance.**

Materials Savings Benefits

Reclaimed materials may be underpriced because of special subsidies to virgin materials or market imperfections. The benefit to the province

* See Middleton Associates. Net Energy Savings From Solid Waste Management Options. The estimated quantity of fossil fuel energy saved by EFW has been incorporated in the computerized evaluation framework created to assess the options. The value of the energy security premium is a user specified variable. See Appendix 7 for a brief description of the model and Appendix 4 for some indicative results of the implicit energy security premium involved in different levels of support for EFW.

** See Appendix 6 for a more detailed discussion of this point.

province is the difference between the market price and the true value of the material.*

Saved Economic and Social Impacts of Landfill

These are highly situation specific. The EA process should help to ensure that these impacts are accounted for relatively accurately. Encouragement of better accounting systems and of compensation for affected individuals is also possible. In the absence of these changes, it is difficult to make a blanket provincial incentive to incorporate this impact adequately and equitably.**

Jobs and Economic Activity

The computerized evaluation framework allows the calculation of total jobs and economic activity associated with the implementation of source separation and EFW program alternatives. Can these be considered benefits of the program?

First, in comparing any two activities, the one costing more will almost inevitably create more jobs. In the case of the 4Rs, reduction by using less will always create fewer jobs -- should this be considered a negative factor for reduction? Secondly, if two activities cost the same, the differences in jobs created often boils down to different wage rates -- more jobs because of lower pay per job.***

Any government expenditure will create economic activity and employment. One question is: will it create net jobs compared with the alternative program? Normally government initiatives with the potential to create a self-sustaining industry come out best on this account. A second question is: how accurate are the estimates produced? The economic tools available produce very crude estimates of indirect and induced effects. Finally, what are the nature of the job differences identified -- Are they due to lower wage levels? Are

* The evaluation framework provides for a user specified materials premium.

** Appendix 6 section 9 discusses an approach to dealing with these impacts in a detailed fashion, comparing the approach of attempting to make process changes to better incorporate the effects with the approach of using an EFW or source separation economic incentive or other credit.

*** It is necessary to look not just at direct impacts, but indirect and induced ones as well, when calculating job effects. Often one option looks much more labour-intensive at the direct stage, but ends up having about the same total employment impact when the indirect and induced effects are accounted for.

the jobs more evenly distributed across the province than the alternatives?

It may be more appropriate to attempt to capture the beneficial effect of job creation by assessing the project using the benefit-cost approach in the computerized evaluation framework, but valuing the labour component cost at less than the prevailing wage rate.*

Another job related effect relates to source separation's potential to employ the handicapped. In assessing this as a benefit it is important to note that its value may already be captured, in part at least, by the training and related subsidies paid to the program by other government agencies. Only that social value of employing the handicapped not captured by this subsidy should be included.

Impact on Environmental Attitudes

Involving the householder in source separation can increase environmental attitudes and conserve behaviour in other spheres.** Clearly it appears to be one of the positive spin-offs of source separation programs, but it is very difficult to quantify.

* See Appendix 6 section 5 for a more detailed discussion of this.

** Energy conserving behaviour or other waste reducing activities can be encouraged. In Kitchener, there was a dramatic increase in the response to a home composting program after local citizens had been involved in the source separation program.

ANNEX 2

THE ROLE OF LANDFILL REQUIREMENTS AND THEIR IMPLICATIONS FOR 4RS

ANNEX 2

THE ROLE OF LANDFILL REQUIREMENTS AND THEIR IMPLICATIONS

FOR 4Rs

Even a significant increase in 4Rs activity will leave waste requiring disposal. Thus, landfill is likely to remain a central part of solid waste management systems in Ontario.

Landfill policy is inextricably intertwined with 4R strategy. A move to more environmentally stringent landfill could greatly assist the alternatives if done as part of a commitment to increasing the 4Rs.

It would include some combination of measures as:

- . Tighter environmental regulations on landfill
- . The implementation of a perpetual care program
- . The use of the EAB to require full costing of landfill and a full credit to alternatives.
- . The strengthening of compensation measures for those affected in areas neighbouring landfill
- . The levying of a landfill surcharge
- . The narrowing of the jurisdiction for disposal responsibility (to encourage the implementation of landfill alternatives within local areas unable to locate a landfill)
- . The discouragement of crossing municipal boundaries for waste disposal
- . The discouragement of export of waste to U.S

The 4Rs would be further promoted by discouraging landfill. The more radical measures such as jurisdictional narrowing and discouraging of boundary crossings would have the greatest impact.

Another strategic variant emphasizing the importance of improving landfill quality would have a quite different effect on resource recovery and EFW and perhaps on source separation as well. It would emphasize good landfill as the centrepiece to future solid waste management in Ontario. Proponents of this view might argue that solid waste management problems can be best addressed by encouraging state-of-the-art landfill performance. The argument would run that better landfill is the most cost-effective approach

to the solid waste management problem and to landfill crises, where they exist. In this view the strategy would involve

- . More stringent landfill requirements
- . Strong encouragement to develop large sites serving several jurisdictions, located in hydrogeologically acceptable areas, highly engineered as appropriate.

To the extent that the higher capital costs and haul requirements increase disposal costs this would encourage the 4Rs. However, if subsidizing mechanisms are set up to encourage this approach (eg. transport subsidies) the alternatives would suffer. They would be discouraged under this scheme in any case if the large landfill could be located where its capital and operating cost advantages outweigh the transportation advantages of resource recovery, EFW and source separation.*

* If the resource recovery or EFW plant could be located closer to the solid waste generation centroid.

ANNEX 3

PRELIMINARY OPTIONS: IDENTIFICATION FOR EFW AND SOURCE SEPARATION

ANNEX 3

Preliminary Options: Identification for EFW and Source Separation

A range of options for energy from waste and source separation is identified below. They were set out for the interim report and to give an example of the range and the factors included. They are not integrated with an overview of a 4Rs role for the Ministry. Four have been selected for each of source separation and EFW. The computerized analytical tools developed for this project can be utilized to draw out the implications of those alternatives selected for more detailed evaluation.

They do not cover the full range of options possible - for example, some elements of one could be mixed with others to form different variants. It should be pointed out that the retrenchment option is not really relevant for the short term since the Ministry of the Environment appears to have decided to opt for an enhanced source separation program.

Source Separation Options

Option 1	Retrenchment
Option 2	Moderate Encouragement of Self-Sustainable Source Separation
Option 3	Moderate Encouragement with Continuing Provincial Incentives
Option 4	Major Encouragement

EFW Options

Option 1	Retrenchment
Option 2	Moderate Encouragement on a "Case-by-Case" Basis in Short Term; Leave Longer Term Option Open
Option 3	Encouragement -- General
Option 4	Active Encouragement Targeted on Specific Solid Waste Management Problem Areas

Source Separation Strategic Option 1:

RETRENCHMENT

Theme/Strategic Thrust	<p>Use the existing solid waste processes and traditional government role to guide activity in the source separation area.</p> <p>Source separation to exist only where market forces, local landfill constraints and local support for source separation is sufficient to sustain them.</p>
Possible Rationale(s)	<p>Solid waste management decisions should be made locally based purely on prevailing market conditions provincial landfill regulations, provincial regulatory processes and local political pressure.</p> <p>The benefits from source separation accrue mostly locally and have few distinct provincial elements which merit special ongoing support.</p> <p>The province's role should be to regulate solid waste management and to remedy information deficiencies where they are obvious and ensure the solid waste management process is equitable.</p>
Information Activities	<p>Provide information on new techniques, methods and approaches only. Perhaps provide some support for conferences, exchanging information on source separation experiences across the province.</p>
Technology Demonstration Activities	<p>Support only technology demonstrations which are not done elsewhere and those which have obvious potential benefit for Ontario. Target primarily problematic wastestream constituents.</p>
Market Development Activities	<p>Attempt to remedy obvious inequities in secondary materials markets which the provincial government has the levers to address. Watch briefly. Provide some information on market activity. Provide selective support for new product developments using recycled materials.</p>

Source Separation Strategic Option 1:

RETRENCHMENT

(Continued)

Commercialization Support
for Source Separation

None. Allow existing program to lapse.

Ongoing Economic Support

None.

Vehicles for Ongoing
Funding

Not applicable.

Likely Outcome

Only multi-material programs with significant existing municipal support are likely to survive. Future expansion will depend purely on market forces, local landfill requirements, the Environmental Assessment process and local political pressure. Single material programs are likely to come and go with market conditions.

Source Separation Strategic Option 2:

MODERATE ENCOURAGEMENT OF SELF-SUSTAINABLE SOURCE SEPARATION

Theme/Strategic Thrust	<p>Encourage extension of source separation programs but as market conditions and local support permits.</p> <p>Use public support, economic start-up incentives, existing process and market development to assist in extending programs.</p>
Possible Rationale(s)	<p>There are source separation benefits which are of special interest to the province, but which are not adequately reflected in current decision making. These are not purely captured by the cost of landfill, even when landfill is fully costed.</p> <p>Start-up inertia is a major problem, which if overcome can lead to a sustainable program for selected municipalities. To fully leverage local pressure on municipal government, a well-run start-up program must be in place.</p>
Information Activities	<p>Support conferences, newsletters, etc. exchanging information on source separation experiences across the province. Continue to supply information on program start-up. Emphasize distribution of information on new effectiveness-promoting techniques.</p>
Technology Demonstration Activities	<p>Provide a moderately aggressive technology support program targeted on developments which have a good chance of success.</p> <p>Fund innovative programs which target problematic wastestream components but which also offer significant improvement in collection economics for the traditional wastestream components.</p>
Market Development Activities	<p>Provide government support for market development. Focus on a facilitative and communicative role among market players, using moral suasion where possible. Put additional attention on such traditional activity as government purchasing programs, redressing inequities in the primary materials market and developing new uses for recycled products.</p>

Source Separation Strategic Option 2:

MODERATE ENCOURAGEMENT OF SELF-SUSTAINABLE SOURCE SEPARATION

(Continued)

Market Development Activities (Continued)	Perhaps provide a contingency plan to help sustain source separation programs during market downturns (a strategy for involving municipalities and major market players in a "fall back" option may be appropriate).
"Seed" Economic Support	Provide incentives for start-up period only.
Criteria and Provincial Coverage	<p>Incentives should have the objective of directly involving the municipality so that the program shortfall will be taken on locally.</p> <p>Incentives should also encourage development of program efficiencies. It could be a tonnage-based fee geared to municipal willingness to pay with a sliding-scale phaseout period. Or it could be a one-time only capital-based contribution.</p> <p>Total amount devoted to the program could be set according to a variety of criteria -- eg, an estimate of the total benefits of the program to the province or set annually on a first-come first-served basis depending upon the province's perception of the ability of the secondary materials market to withstand program additions.</p>
Ongoing Economic Support	None.
Vehicles for Ongoing Funding	Not applicable.
Likely Impact	This approach will help leverage source separation in municipalities who are in the process of acquiring landfill and/or who have landfill problems. It could also, through a demonstration effect, involve other municipalities who are pressured by constituents. The uptake may be fast or slow depending upon market conditions and the bandwagon effect of the current program.

Source Separation Strategic Option 3:

MODERATE ENCOURAGEMENT WITH CONTINUING PROVINCIAL INCENTIVES

Theme/Strategic Thrust	<p>Encourage extension of source separation programs as market conditions and local support permit, with continuing provincial economic support.</p> <p>Use forces of public support, existing process and provincial market development initiatives to assist.</p>
Possible Rationale(s)	<p>There are source separation benefits which are of special interest to the province, but which are not adequately reflected in current decision making.</p> <p>These are not purely captured by the cost of landfill, even when landfill is fully costed. Continuing provincial support is warranted by the magnitude of the benefits. Political support is widespread across the province.</p>
Information Activities	<p>Support conferences, newsletters, etc. exchanging information on source separation experiences across the province. Continue to supply information on program start-up. Emphasize distribution of information on new effectiveness-promoting techniques.</p>
Technology Demonstration Activities	<p>Provide a moderately aggressive technology support program targeted on developments which have a moderately good chance of success.</p> <p>Fund innovative programs which target problematic wastestream components but which also offer significant improvement in collection economics for the traditional wastestream components.</p>
Market Development Activities	<p>Put in place significant market development program. Play an active facilitative and communicative role among market players, using moral suasion where possible.</p>

Source Separation Strategic Option 3

MODERATE ENCOURAGEMENT WITH CONTINUING PROVINCIAL INCENTIVES

(Continued)

Market Development
Activities
(Continued)

Place special attention on such traditional activity as government purchasing programs, redressing inequities in the primary materials market, developing new uses for recycled products.

Perhaps provide a contingency plan to help sustain source separation programs during market downturns (a strategy for involving municipalities and major market players in a "fall back" option may be appropriate).

Ongoing Economic Support

Provide ongoing incentives to program
Total amount devoted to the program could be set according to a variety of criteria - eg, an estimate of the total benefits of the program to the province or set annually on a first-come first-served basis depending upon the province's perception of the ability of the secondary materials market to withstand program additions.

It could also be linked directly to municipality's willingness to pay a premium for source separation *

Vehicles for Ongoing
Funding

Incentives should have the objective of directly involving the municipality so that some of the program shortfall will be taken on locally. Incentives should also encourage development of program efficiencies. It could be a tonnage based fee geared to municipal willingness to pay.

*The premium would be calculated as the difference between the municipality's least cost alternation (e.g.. a landfill only system) and the source separation option.

Source Separation Strategic Option 3:

MODERATE ENCOURAGEMENT WITH CONTINUING PROVINCIAL INCENTIVES

(Continued)

Vehicles for Ongoing
Funding
(Continued)

Perhaps set up a fund which municipality could draw on to administer as required: either on a tonnage basis, or as "renewable" capital grant. The funding could be done via:

- a provincial landfill levy
- a fund financed through general revenue.

Likely Impact

This approach will help leverage source separation in municipalities who are in the process of acquiring landfill or who have landfill problems.

It could also, through a demonstration effect, involve other municipalities who are pressured by constituents. The uptake may be fast or slow depending upon market conditions and the bandwagon effect of the current program.

It will decrease the number of programs which go under after an initial start-up period and will encourage municipalities who are reluctant to pay out the amount required for full backup.

Source Separation Strategic Option 4:

MAJOR ENCOURAGEMENT

Theme/Strategic Thrust

Encourage accelerated widespread extension of source separation across the province. Use a combination of a major influx of funds (public and/or private) to provide driving force. One version of this strategy has container legislation playing the central role -- the introduction of aluminum and plastic provides the incentive for private involvement and the economic underpinnings for a sustainable system.

An alternative strategic thrust is to mandate source separation programs for municipalities in Ontario.

Possible Rationale(s)

The province should have a stringent source separation target to meet. There are major source separations to the province not reflected in current decision making.

Source separation should be practiced as widely as possible because of these benefits despite the subsidy that may be required beyond what many municipalities are willing to pay.

Container regulations provide a unique opportunity to extend source separation across the province.

Political support exists for source separation across the province.

Information Activities

Provide major training programs for new source separation operations. Also support conferences, newsletters, etc. exchanging information on source separation experiences across the province. Continue to supply information on program start-up. Emphasize distribution of information on new effectiveness-promoting techniques.

Source Separation Strategic Option 4:

MAJOR ENCOURAGEMENT

(Continued)

Technology Demonstration
Activities

Provide an aggressive technology support program targeted on developments which have a moderately good chance of success. Fund innovative programs which target problematic wastestream components but which also offer significant improvement in collection economics for the traditional wastestream components.

Market Development

This must be a major government support activity. Focus on a facilitative and communicative role among market players; place heavy emphasis on moral suasion. Emphasize government purchasing programs, redressing inequities in the primary materials market, developing new uses for recycled products.

An alternative or supplement is to obtain guarantees from major purchasers on basis of container-related commitments.

Actively investigate contingency plan for market downturn.

"Seed" Economic Support

Provide widespread support, not necessarily linked to willingness of municipality to pick up diversion credit for shortfall.

Criteria and Provincial
Coverage

Provincial coverage could be province-wide or more restricted depending upon the phasing-in plan and the role of the changes in container legislation.

If the province decides to mandate source separation, it could either ignore the financing requirement, leaving it on the municipality's shoulders or provide a source separation fund from which the municipalities could draw.

Source Separation Strategic Option 4:

MAJOR ENCOURAGEMENT

(Continued)

Ongoing Economic Support

The magnitude of the ongoing economic support depends on the effectiveness of marketing activities, the nature of the materials handled by the system, and the geographic spread of the system. In order to sustain the system, however, it will be necessary to provide funds on the basis of some formula. One approach would be to provide up-front capital grants, renewable as the capital equipment required replacement. Another possibility is to provide an ongoing tonnage-based grant.

Vehicles for Ongoing
Funding

Depending on the manner in which the program strategy was implemented, the vehicle could be:

- . A combination of private and public sector up-front grant
- . A provincial fund financed through a landfill levy
- . A provincial fund financed through general tax revenues (presumably Ministry of the Environment's budget)
- . A separately funded institution, such as a Crown Corporation administering the grant.

Likely Impact

Major additional quantities of recyclable materials would be recovered. Whether these materials would be actually recycled depends on market conditions and market development. So too does the cost of sustaining the system over time.

EFW Strategic Option 1:

RETRENCHMENT

Theme/Strategic Thrust

Energy from waste plants should be implemented only where current economics, available federal incentives and local support for landfill alternatives are sufficient to sustain them.

Possible Rationale(s)

Solid waste management decisions should be made locally, based purely on prevailing energy marketing conditions, provincial landfill regulations, provincial regulatory processes.

The solid waste management related EFW benefits accrue mainly to the local community. The special energy benefits relating to the use of an Ontario energy source are adequately rewarded by the Class 34 write-off.

The province's role should be to regulate, remedy information deficiencies and ensure that the process treats EFW equitably.

There is no clear consensus in Ontario that EFW is an environmentally-superior technology.

The technology has already been adequately demonstrated in other jurisdictions.

Information Activities

Provide information on new techniques, methods and approaches only. Perhaps support funding of feasibility studies. Perhaps assist process of clarifying dioxin issue.

Technology Demonstration
Activities

Support only EFW technologies which have not been demonstrated elsewhere and have a real prospect for significant commercialization in Ontario.

Market Development
Activities

Provide market activity through funding of feasibility studies and conferences on energy from waste activities.

Commercialization Support
for EFW

None. Allow existing "case-by-case" program to lapse.

EFW Strategic Option 1:

RETRENCHMENT

(Continued)

Criteria and Provincial
Coverage

Not applicable.

Ongoing Economic Support

None.

Vehicles for Ongoing
Support

Not applicable.

Likely Impact

Only those MSW EFW plants with existing FIRE grants (Peel) have reasonable chance of success. Future MSW plants will depend upon a very good energy fit and a willingness of the municipality to pay a tipping fee premium. Selected industrial applications could provide an ongoing market.

EFW Strategic Option 2:

MODERATE ENCOURAGEMENT ON A "CASE-BY-CASE" BASIS IN SHORT TERM;
LEAVE LONGER TERM OPTION OPEN

Theme/Strategic Thrust	<p>Provide financing to those plants having good prospects of success in short term, primarily to avoid losing the leverage of the FIRE grant program for those projects which have already received commitments.</p> <p>However, make no longer term commitment to EFW pending a "sorting through" of the environmental issues relating to the technology in Ontario.</p>
Possible Rationale(s)	<p>EFW provides important energy benefits to the province. It also is the technology with the greatest solid waste diversion potential. These benefits are not reflected in current decision making adequately.</p> <p>The technology is environmentally sound and so should be supported in the short term, but municipal and public confidence in the dioxin performance of the technology should be deepened before any longer term commitments are made.</p>
Information Activities	<p>Provide information on new techniques, methods and approaches only.</p> <p>Begin process of dealing with the dioxin issue publicly -- through NITEP result publication and/or additional Ontario initiatives.²</p>
Market Development Activities	<p>Short term holding pattern pending longer term decision. Funding selected feasibility studies and conferences on energy from waste activities.</p>
Ongoing Economic Support	<p>Provide capital grant on case-by-case basis using criteria such as a reasonable return to the proponent and the perceived value of the project to the province. Perhaps base grant on evaluation of energy benefits.</p>

²See discussion on Dioxins: Strategic Alternatives in Appendix 4, Section 4.

EFW Strategic Option 2:

MODERATE ENCOURAGEMENT ON A "CASE-BY-CASE" BASIS IN SHORT TERM;
LEAVE LONGER TERM OPTION OPEN

(Continued)

Vehicles for Ongoing
Funding

Capital grants, provincial sales tax relief,
operating grants, pollution control
monitoring support.

Likely Impact

Gives high change of success to projects with
FIRE grant. Other projects' success depend
on magnitude of grant made available.

EFW Strategic Option 3:

ENCOURAGE OF EFW -- GENERAL

Theme/Strategic Thrust	Encourage EFW plant development as conditions of economic fit, energy value and diversion credit value, dictate. Provide program of economic support on the basis of stated criteria.
Possible Rationale(s)	<p>EFW has energy, environmental and related benefits which are not reflected in local decision-making process, even with full costing of landfill.</p> <p>The province should provide an incentive which reflects this benefit based on the perceived energy and environmental value.</p>
Information Activities	Continue supply of information on EFW technology promotion. Provide environmental information support on leachate/emissions tradeoffs.
Technology Demonstration Activities	Support demonstration of new technologies with reasonable chances of success.
Market Development Activities	<p>Support feasibility studies. Make the provincial government and its institutions a priority market by adopting a government policy to provide full energy value to EFW facilities.</p> <p>Encourage Ontario Hydro to play an active role as energy customer in these projects, perhaps giving these projects a special priority.</p> <p>Encourage proponents and projects to cost minimize -- eg, public sector.</p>
Ongoing Economic Support	Could be based on an energy value "plus" a cost-sharing agreement with the municipality -- eg, equivalent to the amount the municipality is willing to pay over and above its avoided cost of landfill. Or could base grant on evaluation of energy and environmental benefits.

EFW Strategic Option 3:

ENCOURAGE OF EFW -- GENERAL

(Continued)

Ongoing Economic Support
(Continued)

It may be necessary to set up different criteria for different kinds of plants. The economic advantage that dedicated industrial users have should be taken into account.

Vehicles for Funding

If based on evaluation of energy and environmental benefits could be:

- . Percentage-based capital grant
- . Tax-based support to replace/supplement Class 34
- . Could use Crown Corporation with equity participation

Likely Impact

Depends fundamentally on the level of grant decided upon. It could have a major positive impact on encouraging those projects which have already been developed but which did not receive a commitment from the FIRE program; as well as those projects which have received FIRE commitments.

EFW Strategic Option 4:

**ACTIVE ENCOURAGEMENT OF EFW TARGETED
ON SPECIFIC SOLID WASTE MANAGEMENT PROBLEM AREAS**

Theme/Strategic Thrust	Encourage EFW plant development but related specifically to particular solid waste management needs, on a case-by-case basis. Perhaps emphasize EFW as a solid waste management technique which can be used to solve solid waste problems of several jurisdictions.
Possible Rationale(s)	EFW has an important role to play as a diversion technology for municipalities with acute landfill problems. As these problems emerge, and deepen, municipalities may be unable to ensure EFW implementation because of project complexity or financial requirements. The province could play an essential role in enabling these projects to go ahead on a case-by-case basis.
Information Activities	Continue information on EFW technology promotion. Provide major encouragement to municipalities with landfill problems.
Technology Demonstration Activities	Support demonstration of technologies with reasonable chances of success.
Market Development Activities	Support feasibility studies in those areas with major solid waste problems. Make the provincial government and its institutions in these areas a priority market by adopting a government policy to provide full energy value to EFW facilities. Encourage Ontario Hydro to play an active role as energy customer in these projects, (perhaps a preferential rate).
Special Provincial Role	The province could act as project facilitator/director. In order to cost minimize, it could encourage specific kinds of energy markets and energy users (see the sensitivity analyses in Appendix 4).

EFW Strategic Option 4:

ACTIVE ENCOURAGEMENT OF EFW TARGETED
ON SPECIFIC SOLID WASTE MANAGEMENT PROBLEM AREAS

(Continued)

Economic Support

Provide economic support on fixed formulae basis -- eg, cost share with municipality, perhaps half of the tipping fee premium the municipality is willing to pay.

Provide support on an as required basis to encourage implementation.

Vehicles for Funding

Special fund for "special problem" waste management jurisdictions.

Special Crown Corporation to act as project facilitator/director and provide equity participation.

Capital grants, loans, tax breaks as needed on ad hoc basis.

Cost sharing formulae administered by province as indicated above.

Likely Impacts

Solution could prove useful for municipalities such as Halton with critical waste management problems but who have had trouble putting projects together. Temp will depend upon nature of funding formulae and progress of "problem" municipalities through EA.



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